SCIENTIFIC AMERICAN

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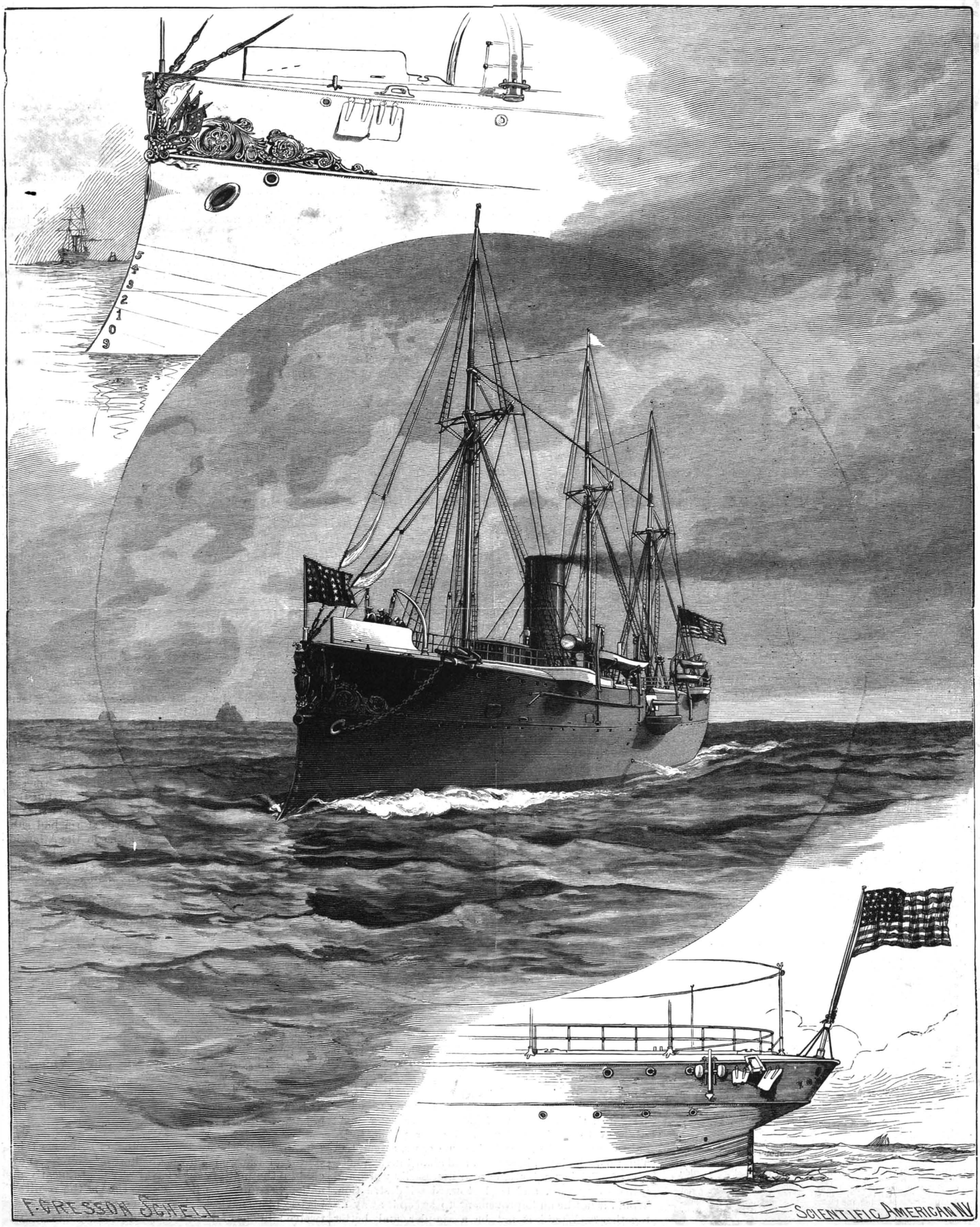

THE LAST ADDITION TO THE NEW NAVY—THE U. S. GUNBOAT YORKTOWN.—[See page 69.]

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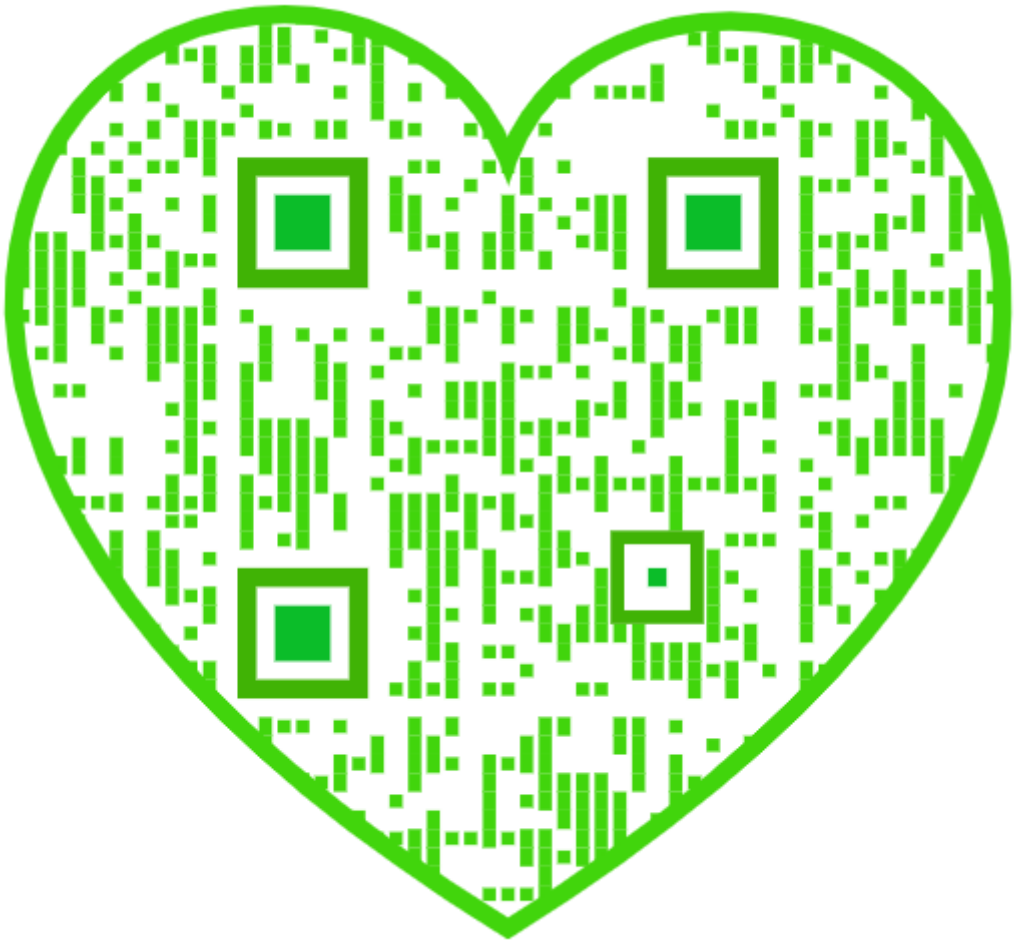

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COMPLAINTS AGAINST THE PATENT OFFICE.

A series of articles was lately published in the New York *World*, containing a long string of complaints and charges against the employes of the Patent Office. They were accused by inference, if not directly, of carelessness, neglect of duty, favoritism, corruption, fraud, bribery, deceit, malice, injustice, systematic efforts to swindle, persecute, and defeat inventors in their endeavors to secure patents; together with other irregularities. But no individual names were mentioned. These revelations were backed up by a curious and interesting collection of letters, opinions, and criticisms given by inventors, patent solicitors, and patent lawyers; some of whom delivered bitter complaints, because the Patent Office had been stupid or failed to do or grant what they wanted; nearly all expressed a belief in the necessity for reform in the management of the bureau. The published matter formed a grand howl, or newspaper earthquake of the most sensational kind.

We are glad to be able to say, however, the Patent Office has survived the shock; the officials are still at their posts; they are not even begrimed with the smoke; and the grand old machine continues to grind out every week its immense quota of five or six hundred patents for new inventions; in reward for the genius of inventors, by which the industries of the country are so constantly diversified, increased, improved, and maintained.

But are there no difficulties at the Patent Office, no opportunities and no practice of knavery, as the *World* has described? Do the officials never act in bad faith toward inventors? Are they always pure and faithful? Do they never purposely delay business, abridge claims, or give real cause for complaint?

It would be strange if they did not. They have great power. They are, for the inventor, his judges and his jury. Moreover, they are mortals, made of clay like the rest of us. They are hunted, badgered, and tempted, from morning till night, by a crowd of anxious applicants or hungry agents, asking for decisions or complaining of those already made. Each wants his case taken up at once, ahead of all others. Many are suspicious persons, who imagine the examiner is trying to steal his invention or defraud him of his rights. There is no end to the mean and irritating things such individuals will say or do. Some agents are so self-sufficient they consider themselves insulted if an examiner calls attention to gross blunders in their papers. In short, the time, patience, and skill of examining officers are often subjected to the severest trials, under which, and the lack of proper facilities for making accurate searches, and the pressure of accumulated work, it is no wonder if many errors, wrong decisions, and irregularities should take place.

Yet, as a whole, it is doubtful if any branch of the public service is so well conducted or shows such splendid results as the Patent Office. The examining officers, as a general rule, are faithful and exemplary men, able, intelligent, and as careful as the circumstances in which they are placed will allow. They do the best they can. But the system under which they labor is defective and leads to endless troubles.

The present law, which aims to provide for a thorough scientific and legal examination of each application for a patent, was passed more than half a century ago, when the sciences and mechanic industries were in their infancy, when inventors were few, patents and new inventions scarce.

More patents are now solicited in a week than were then granted during a year. It was then possible for the government to examine and decide each case with care and deliberation. To do so now is almost out of the question. More than thirty-five thousand applications for patents were made last year. The number steadily increases with the growth of population. Already there are three thousand seven hundred classifications of inventions, sub and general, in the Patent Office.

The duty of examiners is first to see that the patent papers are correct in form, clearly illustrate, describe, and claim the invention; and, second, to make sure that the device claimed has not previously been patented here or abroad, nor described in any printed publication in any part of the world. If the invention has been previously patented or described, then the patent must be denied, for it would be invalid if granted. It is obviously impossible, with the meager force of examiners now employed, to make a legal and scientific examination of thirty-five thousand applications a year. Even the classification and printing of our home patents is so very defective, and the knowledge of them so incomplete, that the examiner cannot be certain of the correctness of his searches among them; while as to foreign patents and other publications, only a superficial glance is, in some cases, attempted. This poor, shadowy, imperfect, and almost useless business of official examination grows necessarily worse and worse every year, and tends toward self-destruction. Would it not be an improvement to sweep it away altogether? Would it not be a simpler and better method to let each inventor become his own examiner? If, after examination, he asks a patent, let it be forthwith granted. Relieve the present examining force from the duty of determining whether it is best to grant a patent or not, and let the inventor examine and decide the matter for himself. It is just as practicable for him to do this as to search the records when buying a piece of real estate.

Let the cost of patent copies be greatly reduced. Let the present examining force be employed to see that the applicant's papers are in proper form, and the records of all previous patents and descriptions of inventions kept well classified and easily accessible. This will occupy their time to the best advantage; and enable them to perform their duties with satisfaction to themselves and all concerned. A modification of the law appears to be imperative, and if made in the direction we have indicated, the delays, litigations, and other hardships to which inventors are now subjected before the Patent Office probably could never occur.

AN IMPORTANT SUPREME COURT DECISION.

A decision of some importance, as affecting the bearing upon American patents of foreign patents for the same invention awarded to the American patentee, was rendered in the United States Supreme Court on January 21. It was in a somewhat celebrated suit, entitled the Bate Refrigerating Co. *vs.* George H. Hammond & Co. A United States patent had been awarded to John J. Bate for a process of preserving meat during transportation and storage. A Canadian patent for five years had been taken out by him previous to the issue of the United States patent. Before the expiration of the Canadian patent it had been extended on payment of the statutory fees for five years, and before the termination of the extension had in like manner been extended for five years more. The law of Canada authorizing these extensions as a matter of right was in force at the time the original patent was granted. The Circuit Court had held, notwithstanding this state of things, that the American patent was limited in term by the original Canadian patent of five years. The Supreme Court disposes of this view, and decides that the fifteen years, although composed in part of extensions, is for the purposes of statute 4,887 to be considered as the integral term of a foreign patent, and declares the Bate patent unaffected as yet by the Canadian term, which does not terminate until 1892. Much comment was made upon this decision by the press, but it will be seen that it is not so broad in its effects as stated by many of our contemporaries. The decision was delivered orally by Judge Blatchford.

Removal of a Hotel at Coney Island.

Our readers will doubtless remember the description we published about a year ago, concerning the moving of the Hotel Brighton, one of the largest hotels at Coney Island.

Another neat piece of work has just been accomplished in the removal of the Ocean House at the same place. This large hotel, 42 × 55, two stories high, with large piazza, was erected twenty years ago, and at that time stood about 600 feet back from the surf. The many changes in the beach since then have washed all this land away. The hotel was placed upon piles two years since, as the indications were that at any time the foundations might be washed away. This proved true, for last year the ocean had reached the hotel, but no immediate danger was feared, as the piles were 20 feet long and firmly bedded in the sand. The owners of the hotel thought it safe, and expected, from its situation over the ocean, the attractiveness of the site would benefit the business. This was the fact, but this winter, during a heavy easterly storm, another slice of the beach was removed, and when the storm had subsided, the hotel was left quite alone in the Atlantic, some 50 feet from shore, standing on piles. There was a probability of the sand cutting away and leaving no support for the piles, and also the danger of floating logs or ice battering them down, and it was decided to remove the building. The contract was awarded to Messrs. Louis Heineman & Sons, of Brooklyn, and they have just successfully removed the building to the solid ground, and it now stands some 300 feet back from the beach. The plan of operations was as follows: Rows of piles were sunk by water pressure under the hotel, reaching to the shore; these were capped, and upon them were laid heavy yellow pine sliding ways. Upon these ways the hotel was raised, the old piles being left standing. By crabs on the shore the building was pulled and slid from its position over the ocean to the bank. It is now securely located on *terra firma*, and has been preserved from being completely washed away, as the piles upon which it rested were undermined and carried out to sea almost before the hotel had reached its new home.

THE late Benjamin B. Hotchkiss, of Bridgeport, inventor of the well known quick-firing cannons, now used in the military and naval services of nearly all nations, acquired an immense fortune as the result of his ingenious devices. He left an estate valued at over twelve millions of dollars. His heirs are now litigating about the disposal of these millions, and the lawyers are likely to reap a harvest.

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The International Exhibition of 1889.

(FROM OUR SPECIAL CORRESPONDENT.)

PARIS, January 12, 1889.

The first impression one receives on a general survey of the Paris exhibition buildings is an exceedingly favorable one. There is a something about them that is pleasantly impressive, and this feeling augments as one passes through the various departments.

What it is that gives this impression is not at first clearly definable, but reflection discloses that it is the ornamentation, which is charming in its effective unobtrusiveness. Certainly no other exhibition has approached this one in the ornamentation of the windows and walls of the interiors, as well as the exteriors of the buildings. It is too early, however, to dwell upon this point, as much of it is only fairly begun.

The buildings are, as a whole, well advanced, and, so far as one can at present see, the opening day (May 4) will find matters in better order than is usually the case with exhibitions.

An American cannot well avoid a comparison of this with the Centennial exhibition of 1876, and will at once concede that, so far as the buildings are concerned, this Paris exhibition is quite beyond comparison, not so much in size, however, as in refined beauty.

If one confines himself to the grounds on which the exhibition stands, the Centennial exhibition has the advantage, or if one leaves the scenes outside the entrance gates out of mind, and thinks only of the actual exhibition grounds, then the Centennial again has the advantage. But the entrance to the Paris exhibition will be delightful, especially if one goes through the Trocadero, across the Seine, and past the Eiffel tower.

When we come to the arrangements of the exhibits, there may be room for a difference of opinion; for example, agricultural implements will be in the agricultural department, which is separate from the machinery department; hence, the effect, so far as it depends upon the magnitude of the exhibits, is diminished. On the other hand, however, to whatever extent the general machinery department suffers on account of the absence of the agricultural machines the agricultural department obviously gains, and it is perhaps preferable to have each special class of machinery exhibited in connection with the particular class of human industry to which it belongs, or with which it is most intimately associated. Nobody, however, who visited the Centennial exhibition of 1876 is likely to forget the impression made by the immensity of the machinery department, notwithstanding the comparative crudeness of the building. The Paris exhibition does not, it must be admitted, duly impress one with its immensity, notwithstanding that some of its buildings are over two miles apart in a continuous line. Even the main buildings are not impressive in their magnitude when viewed from their interiors, which occurs from the internal subdivisions.

It is these internal subdivisions which afford such opportunities for ornamentation, and that, therefore, lend the peculiar charm I have before referred to. At the Centennial one might spend hours in one department (as, for example, in the main building), and after the first *coup d'œil* (taking in the immensity), the building would attract but little attention or interest.

The machinery department is well advanced. The Brown engine, of which the SCIENTIFIC AMERICAN gave illustrations in 1877, is to be exhibited, and no worthier example of the best American workmanship is to be found. Some of your readers will possibly remember that some of the visiting English engineers fell into a singular blunder at the Centennial exhibition of 1876; inasmuch as that they condemned the nickel plating of the Putnam lathes, of the Brown engine, and of some other American exhibits; whereas these exhibits were simply highly finished with ordinary mechanics' tools, and not plated. There are, I hear, firms in England who are producing equally as high a grade of workmanship, but there is, to my mind, no risk at all in prophesying that no piece of machine or engine building will exceed the Brown engine for quality of fit, while none will equal it for finish.

It is reported here that Professr J. E. Sweet has just concluded to exhibit one of his new 100 horse power straight line engines. This is welcome news, for there is an American stamp of originality in this engine, *i. e.*, there are numerous departures from ordinary designs, and a sound reason for every departure.

Both these engines are to drive sections of shafting; the latter, however, not being as yet erected. I do not know if the various sections of shaft in each line are to be connected by a coupling or not. The bearings for the shafting are not self-adjusting in any respect, but this does not much matter, because the frame pillars on which they stand are bolted to heavy stone and cement foundations, and there is nothing to deflect or sag and throw the shafting out of line.

George H. Corliss' experiment of speeding up with gearing is not to be repeated here, nor is it likely to be anywhere else, as far as that goes, for it was too expensive; but it was a beautiful piece of workmanship, and engineers would remember the Centennial if for nothing else but Corliss' wonderful gear wheels.

We Americans know but little of French machines and methods of metal working, except it be with reference to the large French steel works, and I purpose, in due course, to investigate these methods, in order to compare them with the American and English.

A word or two may not be out of place with reference to the feeling in England with regard to international exhibitions. I have frequently asked English manufacturers when there was likely to be such an exhibition in England, and the reply has almost invariably been the same, viz., "We don't want any more international exhibitions. They don't do us any good, for the foreigners simply came over and copied our methods." Now, I do not think there is any justice in this. My memory goes as far back, very distinctly, as the exhibition of 1851, and I cannot call to mind any one branch of industry in which English methods were copied. On the other hand, I well remember how some of the foreign exhibits were held up by the English press as models for the English to follow; china and crockery ware being prominent examples. In this connection the fact is recalled that English visitors to the Centennial exhibition at Philadelphia returned home and copied many American machines and methods; and, as a case in point, I believe that Messrs. Smith & Coventry, of Manchester, did so, with great advantage to their shop methods: and no one will dispute that this firm turn out a high class of work. Among other things whose acquaintance English engineers have made at exhibitions may be mentioned the Corliss engine, the Wheelock engine, the French metal cutting saw machines, and American watch making machines. Each of these has been copied in England, while I think I may say the same of the Brown & Sharpe milling machine, the screw machine, and the Morton Poole calender roll grinding machine, and, coming down to smaller matters, the twist drill and the emery wheel.

The space allotted to the United States is not equal to the amount applied for, but there is one vacant space that would be exceedingly valuable for any firm whose products were of sufficient importance and sufficiently ornamental to fill it. This space is the facade at the end of the machinery department. The corresponding facades in other departments are being ornamented by the exhibitors in the respective departments, as much as 200,000 francs having been subscribed for the ornamentation of a single facade. Hence, if any American firm applies for this space, it must be for an exhibit that will be effective in appearance and well up in quality. If the Disstons were to put their minds at work, I should think they could get up a design embracing their saws that would be attractive and suitable.

It is reported here that Edison proposes to span the machinery department with a rainbow of incandescent electric lights, which would, without doubt, be a most effective exhibit.

JOSHUA ROSE.

The Hydraulic Elevator for the Eiffel Tower.

The cylinder for operating one of the lower elevators in the Eiffel tower, in Paris, has just been shipped by the makers, the well known firm of Otis Bros. & Co., of this city. It is no small tribute to American ingenuity and enterprise that a leading French engineer should appeal to America when confronted with a new problem. The elevator starts from one of the legs of the tower, and rises, following an inclined path that varies its degree of inclination, until the landing, 489 feet above the ground, is reached. The difficulty arose from the nature of the course the car had to follow. No satisfactory offer could be obtained from French firms. After the 489 foot landing is reached, the difficulty ends, and an ordinary elevator of French manufacture is used for the remainder of the distance. We give some of the dimensions of the great cylinder: Diameter, 38 inches; length, 41 feet 7 inches; circulating pipe, valve, and water chest, all 9 inches; total weight, 51,400 lb.; working pressure, 180 lb. to square inch. It is two inches thick. The firm have shipped to Paris 300,000 lb. of machinery to run the two elevators.

More Grecian Excavations.

It appears that Delphi, in Greece, where Apollo prophesied for a thousand years, and the Amphictyonic Council sat, may now be purchased by Americans for the purpose of explorations. The Germans have Olympia, the site of the most famous temple of Jupiter, where they have been excavating with rich results. The Greeks are working at the Acropolis in Athens, and the English and Americans in other places. France, Germany, and England have had schools in Greece for study and exploration for some years. The American school has been maintained for six years since its foundation by the Archæological Institute, supported by contributions from American colleges ill able to give. Delphi is regarded as the richest of all sites, and it can now be had for $80,000. The village of Castri, on its site, must be bought and removed. To raise this sum, Professor Charles Eliot Norton, of Harvard, recently came to New York and laid the matter before a few prominent gentlemen at the house of Bishop Potter. He pointed out that if there is any value whatever in the study of the art and literature and philosophy of the ancient world, it must hereafter, in order to be pursued effectively, be pursued in connection with the explorations which are being carried on, both in Asia and Europe, on the sites of Greek and Roman and Egyptian cities and temples. These explorations have already almost revolutionized our knowledge of the Greek and Roman world. The excavation of Delphi would be attended with results of the profoundest consequence, and, as *Frank Leslie's Newspaper* states, no such opportunity has been presented to Americans before, and it is hoped that the sum required may be speedily raised.

For Star Gazers.

Doubtless all of our readers have noticed the brilliant appearance of the planet Venus in the western sky in the early evening hours, and a great many have wondered what its relative position to the earth and sun may be to cause it to shine with such unusual brightness. Many also have noticed that the planet Mars has lingered near Venus for several weeks, and would like to know the reason for this apparent nearness. To such inquiries the almanacs give no response. They merely record the fact of a conjunction or opposition occurring on a certain day, without giving any explanation of the phenomena.

To that large and ever-increasing class of our readers who are interested in the ever-varying appearance of the heavens we commend the concurrent number of the SCIENTIFIC AMERICAN SUPPLEMENT, which contains a most interesting article on the planets for February, 1889, illustrated with what is an entirely new feature in astronomical record—a map of the solar system, giving the exact position of every major planet for the 1st of February, and the amount of movement of each in its orbit during the month.

Being drawn to exact scale, the distances of the planets from the sun, the earth, or each other may be measured with a fair degree of precision, and the cause of every conjunction, elongation, opposition, etc., appears almost at a glance. It also forms a complete index to the position of the planets in the sky at any time of the day or night. In fact, it is a complete key to the movement of the planets for the month, and we have no doubt that large numbers of our readers will be surprised at the number of questions regarding the solar system which may be answered by means of the map.

The Total Solar Eclipse of the Sun, Jan. 1.

The observations of the parties from the Lick Observatory, at Bartlett Springs, were very complete, and will soon be published by the Observatory. A communication from Prof. J. E. Keeler says:

"My own observations were made with a 6½ in. equatorial telescope, to which was attached a spectroscope with the attachment devised by Hastings, and described in the report of the eclipse at Caroline Island. The phenomena which I observed did not correspond exactly with his observations, but are in partial support of his theory.

Prof. Barnard obtained nine photographs with three cameras equatorially mounted on a polar axis driven by clockwork. His negatives have not been developed yet.

Prof. Hill observed the times of contact, assisted me in my work, and studied the structure of the corona with the finder of the 6½ inch telescope. Time was obtained by telegraph from the Lick Observatory.

Prof. Leuschner obtained seven measures of the light of the corona with a wheel photometer devised and made by Brashear.

Mr. Geo. W. Yount made an oil sketch of the corona, and several other persons made sketches, which were given to the party.

The sky was a little hazy, but all the observations were considered successful."

Oxygen.

Pure oxygen gas, says A. H. in the *English Mechanic*, may be obtained from the atmosphere at a trifling cost, so as to enable it to be collected in unlimited quantities in gasometers, like coal gas, for application in the arts, manufactures, etc. This process depends upon a peculiar property possessed by the earth baryta of absorbing oxygen at one temperature and evolving it at another. The process is as follows:

Mix the baryta with a portion of hydrate of calcium or of magnesium; place the mixture in an earthen tube heated to dull redness; oxidize it by passing a current of atmospheric air over it. As soon as the oxidation is complete, connect the tube with the gas holder, and allow a jet of steam to act upon it. This converts peroxide of barium into hydrate of barium, and the excess of oxygen is given off and collected in the gas holder. The baryta is then again oxidized by a fresh current of air and deoxidized by steam. The whole process may be repeated as frequently as required. One ton of baryta thus treated yields about 2,500 cubic feet of pure oxygen every twenty-four hours, and this, as it does not lose any of its properties, at the mere cost of fuel and labor.

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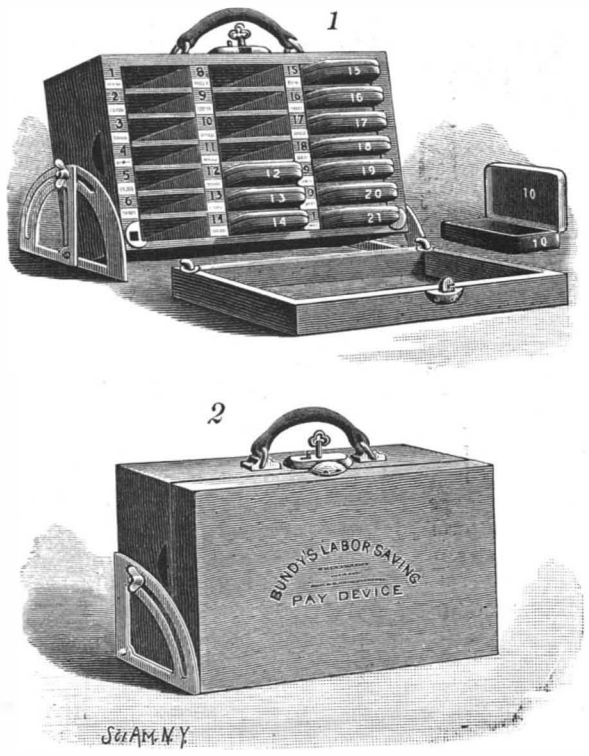
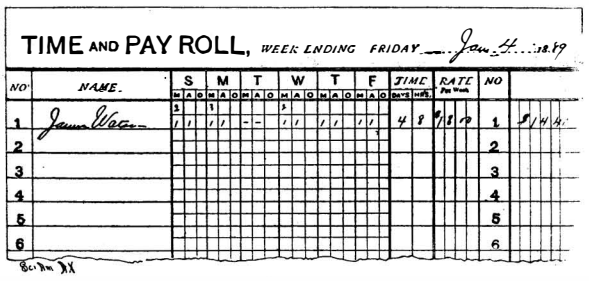
IMPROVED DEVICE FOR USE IN PAYING HELP.

The illustration herewith represents an improved device for use in paying off the employes of business establishments, and facilitating the proper payments to each, without danger of accidental or designed miscarriage. It has been patented by Mr. David W. Bundy, of Toronto, Ontario, Canada. Fig. 1 shows the device as arranged for use, and in Fig. 2 it is closed for



BUNDY'S LABOR SAVING PAY DEVICE.

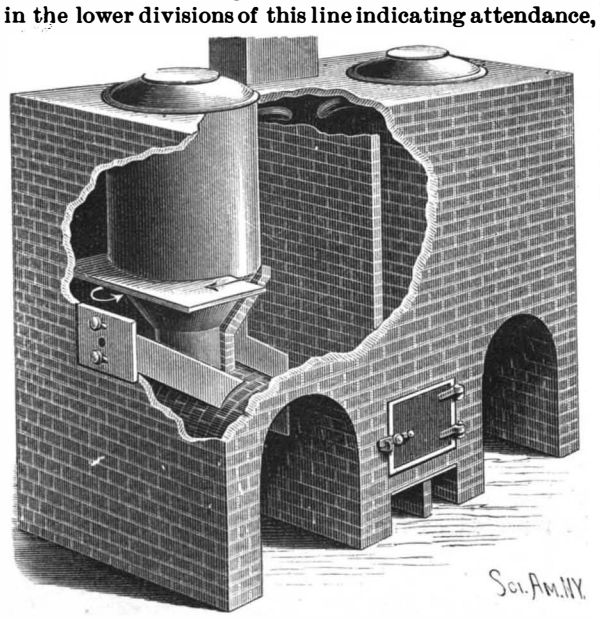
transportation. The main portion consists of a box-like tray provided with a series of pockets, opposite each of which is the name and a number for an employe, these pockets being adapted to receive a number of money boxes, each box bearing the number of its respective pocket. The boxes have their respective numbers on the outside of both ends and on the interior of the hinged lid. A cover which is entirely removable



is provided for the tray, the device being so constructed that the cover can be locked in closed position. To each end of the tray is pivoted a slotted bracket piece, which slides within the limits of the tray or can be adjusted to project outwardly, as shown in Fig. 1, to hold the tray in an inclined position, to enable the characters on the tray and boxes to be more readily observed, and for convenience in placing and removing the boxes, the bracket pieces being adapted to be locked in any position to which they may be adjusted.

This inventor has likewise designed a special form of time and pay roll, to enable business men to record in the most simple and condensed manner the details of the time made by workmen and facilitate making up the amounts due them. In this form, shown herewith, the small letters "M," "A," and "O," under each designation of the days of the week, indicate respectively "morning," "afternoon," and "overtime." There are two lines opposite each man's name, a mark in the lower divisions of this line indicating attendance, while a figure in one of the upper divisions indicates short time in either morning or afternoon, as a figure in the "O" column would indicate overtime.

This inventor has established a factory provided with special machinery for the manufacture of his improved pay device, and may be addressed, for further particulars in reference thereto, at 211 and 213 Lippincott Street, Toronto, Canada.



BLISS' FURNACE FOR DESTROYING REFUSE.

Tracing Curves by Photography.

In the *Bulletin* of the Académié des Sciences de Belgique, M. Eric Gérard describes a new method of automatically registering observations by means of photography. *Engineering* says: In making a research in the variable current supplied by alternate current machines, he had got very good curves by using an extremely delicate and aperiodic galvanometer, the inertia of the moving parts also being extremely small. A beam of electric light was reflected from a very small concave mirror attached to the moving portion of the galvanometer through a lens, falling finally on to a sheet of sensitive paper, on which it cast a very minute image. After some trouble very good results were obtained in this way, but not being completely satisfied, he cast about for some other method of obtaining the same end, the arc light in particular being costly and troublesome. His new arrangement consists of a moderate-sized Ruhmkorff coil, the spark from the secondary coil of which plays between a piece of aluminum wire and the point of a carbon for an arc lamp. The two electrodes are fixed at least one millimeter apart. The spark is projected on to the movable mirror aforesaid, and thence to the sensitized paper, which may be wrapped round a drum, or more conveniently simply stretched on a frame, which can be allowed to fall between guides. The period of the sparks depends solely on the elasticity of the spring of the vibrator of the primary coil, and the number of spots photographed in unit length of the curve on the sensitized paper forms a convenient time scale. By connecting the electrodes of the secondary coil to a couple of small Leyden jars, a very short and white spark is obtained, the position of which is invariable. This plan has the advantage of reducing the dimensions of the numerous spots which make up the curve photographed.

IMPROVED FURNACE FOR DESTROYING REFUSE.

The accompanying illustration represents a furnace for burning or carbonizing refuse, utilizing the same as fuel or fitting it for use as a fertilizer. It forms the subject of a patent issued to Mr. W. H. Bliss, of Newport, R. I. The furnace is constructed principally of masonry, and is preferably about 22 ft. long, 11 ft. wide, and 20 ft. high. There is a space inside the walls at each end, about 6 ft. wide and 9 ft. high, for the removal of carbonized matter when it is desired to use it as a fertilizer, brick division walls separating these spaces from the furnace proper, these walls extending to the top of the structure, and forming the sides of flues on each side, closed at the top and connected with the ash spaces. The retorts are preferably made of wrought iron, and funnel-shaped at the bottom, being tightly closed at the top by large annular covers, in each of which is formed a small cover for convenience in inserting small substances. The retorts are held in chambers communicating with the furnace through inclined flues, so arranged that the heat of the furnace first strikes against a deflecting wall of fire-brick, separated from the cone by an air chamber, thence circulates around the cones of the retorts below a horizontal plate, as shown by the arrows, and then around the main body of the retort above such plate, from which there is a passage to the chimney flue. Below the lower ends of the retorts are inclined chutes, each provided with two valves, operated by means of rods reaching to the outside of the furnace, whereby the contents of the retort can be discharged into the furnace, or into one of the chambers beneath the retorts, to be conveyed away for use as a fertilizer. Pipes connect the interior of the retorts with the flues built into the walls, for conveying away the steam and gases generated in the process and discharging them under the grate bars. The space above the furnace is adapted to receive a steam boiler, that the refuse treated may be thus utilized as fuel in generating steam for power.

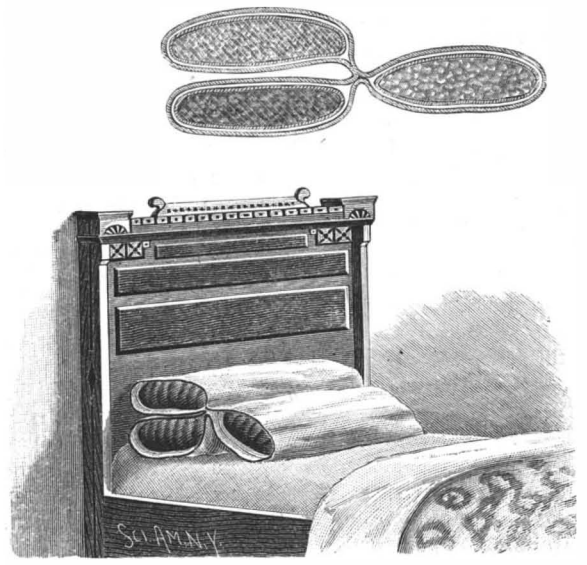
For further information relative to this invention, address Mr. Edward Newton, administrator of the estate of W. H. Bliss, deceased, P. O. Box 703, Newport, R. I.

Exhibitors to the French Exposition.

Manufacturers and others intending to exhibit at the Paris exposition next summer, and wishing some one to represent them and attend to receiving and entering their goods, will find a capable representative in Mr. Wm. Herrick, an American gentleman who has resided with his family in Paris a number of years. Mr. Herrick is favorably known in the American colony and to American travelers accustomed to visiting Paris. His office is at 32 Rue de Paradis, where letters may be addressed and information as to entering exhibits obtained.

AN IMPROVED PILLOW BOLSTER.

The accompanying illustration represents a combination of pillows, or what may be used as pillows and bolster, in one pillow slip, which has been patented by Mr. William T. Doremus, of No. 150 West Twenty-third Street, New York City. Each roll is made an independent pillow covered by its own ticking, while the slip or removable cover is made up of longitudinal compartments adapted to separately receive and hold in parallel relation with each other the independent rolls or pillows, the slip being left open, or made to open, at either or both ends. In use it is designed that the top roll of the pillow bolster should always be in contact with the neck, and in asthma or lung

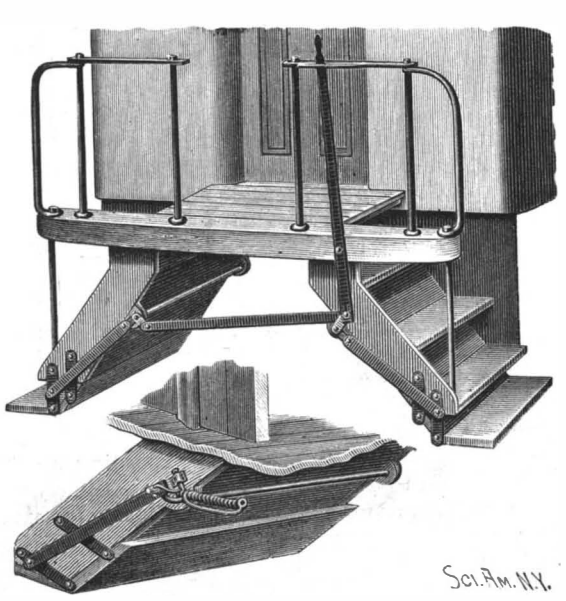


DOREMUS' PILLOW AND SLIP.

troubles, etc., a roll of feathers may support the neck and head, while one or more of the other rolls may be filled with balsam or hops, without incurring any of the discomforts usually attendant upon the use of the ordinary balsam or hop pillow. This combination also tends to facilitate one's getting into a "comfortable position for sleep" with ease and comfort—a matter which is often a subject of considerable vexation and difficulty to those troubled with insomnia.

AN IMPROVED FOLDING CAR STEP.

Extensible car steps, which may be held folded to the permanent steps while the car is moving, and be almost instantly lowered or extended when the car stops, to promote the convenient exit or entrance of passengers, are illustrated herewith, and form the subject of a patent recently issued to Mr. Henry A. Merritt, of No. 49 Third Street, Brooklyn, N. Y. The extensible step is hung at each end to the permanent steps by two links pivoted at their upper ends to the permanent stringer and at their lower ends to the step, a transverse shaft being journaled on the permanent steps and having crank arms connected by bars with the suspension links of the extensible step, whereby the latter may be folded up or extended. These crank arms have wrist pins, with which the opposite ends of a transverse operating bar are pivotally connected, one of the wrist pins being engaged by the lower end of a lever fulcrumed to the car platform, and projecting upward where it may be conveniently reached and operated for extending or folding up the steps. To the wrist of the inner crank arm of each shaft is attached one end of a spiral spring, its other end being connected to a rod fixed to the stringer of the permanent steps, these springs holding the steps in either position to which they may be adjusted, independently of the locking tendency of the bars and crank arms.



MERRITT'S EXTENSIBLE CAR STEP.

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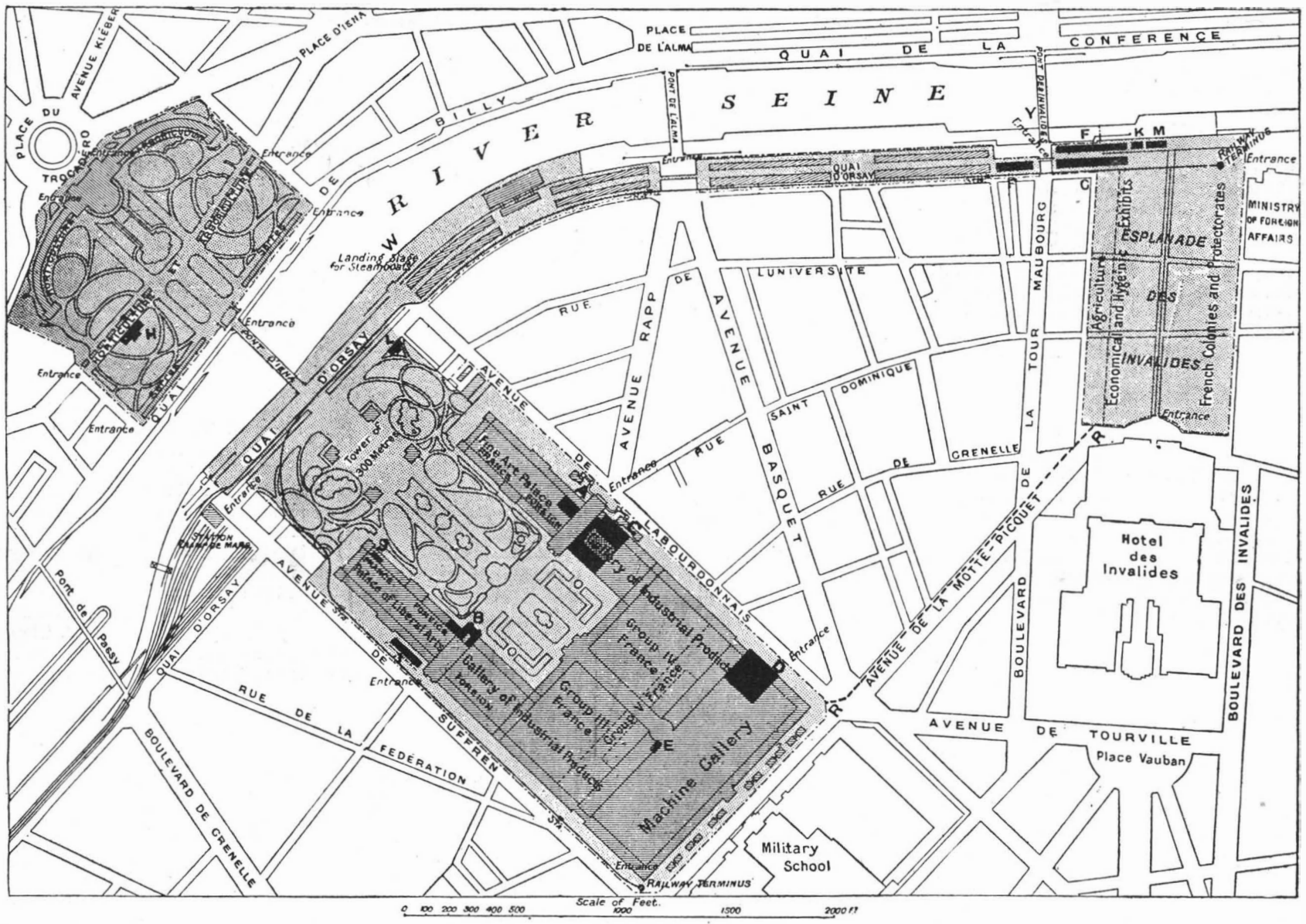

Fig. 1 — PLAN OF THE PARIS EXHIBITION.

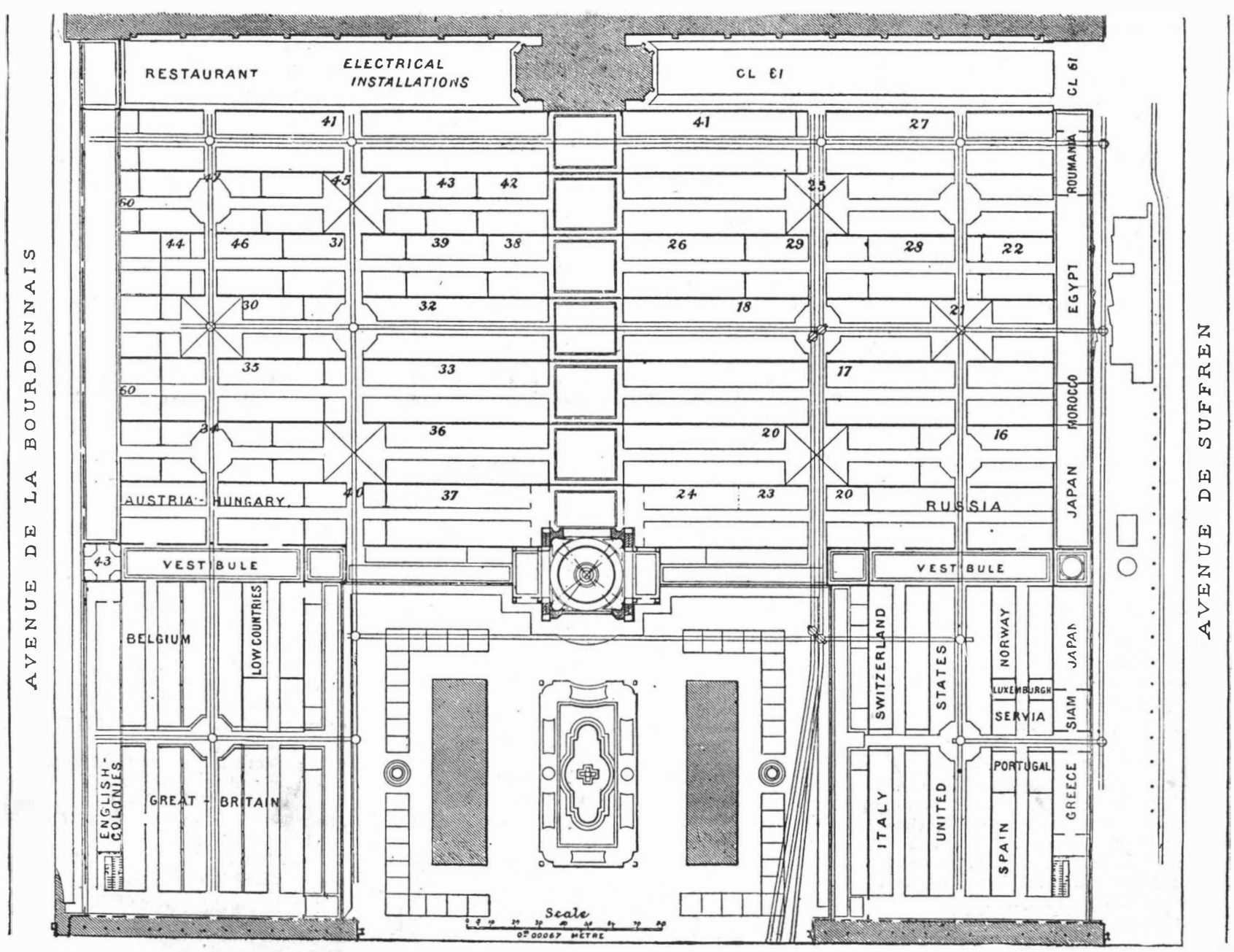

Fig 2 — PLAN OF THE CHAMP DE MARS PALACE.

THE PARIS EXHIBITION 1889.

[For description see page 68.]

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Admission of Air to Rooms.

Air should be introduced and removed at those parts of the room where it would not cause a sensible draught. Air flowing against the body at, or even somewhat above, the temperature of the air of a room will cause an inconvenient draught, from the fact that, as it removes the moisture of the body, it causes evaporation or a sensation of cold. Air should never, as a rule, be introduced at or close to the floor level. The openings would be liable to be fouled with sweepings and dirt. The air, unless very much above the temperature of the air of the room, would produce a sensation of cold to the feet. It may be regarded as an axiom in ventilating and warming that the feet should be kept warm and the head be kept cool.

The orifices at which air is admitted should be above the level of the heads of persons occupying the room. The current of inflowing air should be directed toward the ceiling, and should either be as much subdivided as possible by means of numerous orifices, or be admitted through conical openings, with the smaller openings toward the outer air and the larger openings toward the room, by which means the air of the entering current is very rapidly dispersed. Air admitted near the ceiling very soon ceases to exist as a distinct current, and will be found at a very short distance from the inlet to have mingled with the general mass of the air, and to have attained the temperature of the room, partly owing to the larger mass of air in the room with which the inflowing current mingles, partly to the action of gravity in cases where the inflowing air is colder than the air in the room.—*D. Galton, in the Architect, London.*

Foreign Trade Marks—a Dilemma.

The Californian Fig Sirup Company, of Reno, Nevada, U. S., having registered the trade mark "Sirup of Figs" in the United States in 1885, demanded in January of this year to have the same mark registered in this country. In the Act of 1883 (Section 103) it is provided that, if her Majesty should be pleased to make any arrangement with the government of any foreign State for mutual protection of inventions, designs, and trade marks, then any person who has applied for protection for any invention, design, or trade mark, in any such State, should be entitled to a patent for his invention, or to registration of his design or trade mark (as the case may be), under this Act, in priority to other applicants; but in the case of a design or a trade mark, he must make his application within four months of his application in the foreign State. The same section, further on, provides that any trade mark the registration of which has been duly applied for in the country of origin may be registered under this Act. In March, 1884, her Majesty did please to accede to a convention to which France, Italy, Spain, and Belgium had previously agreed. The United States acceded in 1887. Article VI. of the convention thus acceded to provides that "every trade mark duly registered in the country of origin shall be admitted for registration, and protected in the form originally registered in all the other countries of the union." Under that article the California company claimed the registration of their trade mark "Sirup of Figs" in this country. The comptroller demurred, and argued that he was only bound by the Act of Parliament, and in that the limit of four months was clearly named, and had not been complied with by the applicants. They replied that in the convention such a limit was not mentioned, and they appealed to the board of trade, who referred the case to the court. The point at issue was evidently whether the convention should override the statute, or whether the statute ruled the convention. If the former, then we are bound to register every foreigner's trade mark here if he has got it on the register of one of the countries in the union. If the latter, we are in a degree breaking faith with the co-signers of the convention. Mr. Justice Stirling has ruled against the applicants, but he evidently perceived the dilemma, and said that her Majesty's government would no doubt consider what steps ought to be taken in the way of harmonizing the conflicting claims.—*The Chemist and Druggist (London).*

THE ELECTRIC BLOWPIPE.

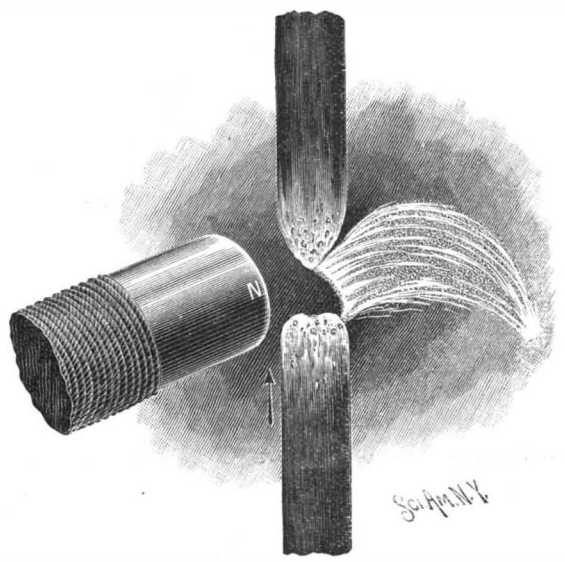
BY SAMUEL SHELDON, PH.D., PROF. HARVARD UNIVERSITY.

The application of dynamo-electric currents for the welding of large pieces of metal, in the mechanic arts, has been practically demonstrated as a success. But its employment has been, of necessity, limited to large workshops, where the amount of work of this character would warrant the purchase of a dynamo. Furthermore, the danger attending the use of powerful currents has deterred many from making use of them, because they have had in their employ mechanics of only ordinary attainments, with no especial knowledge of electricity.

Besides the Thomson-Houston system, which employs a current of very great strength but small electro-motive force, and where the pieces to be welded are brought into contact, two general methods employing the electric arc have been used. The first consists in making an electrode of each of the pieces to be welded, a small space being left where the welding is to take place. If a strong current be sent through, it forms an arc of great heat at this space and the metals are melted, and, running together, form a compact whole. The second consists in connecting both of the parts to be welded to one end of the circuit, while the other end is connected to a movable point, which is brought into close proximity to the joint, and, the arc being formed, gives the same result as before.

For many pieces of work these methods are not practicable. For instance, oftentimes when two pieces are brought into their proper relative positions, if a current be sent through after the first method, arcs will be formed at several places, and junctures will be made in places not desired. Again, in the employment of the second method, the use of two hands is often essential in the manipulation of the work, in which case a second person is necessary to apply the second contact. It is well known that two persons cannot co-ordinate their movements in the efficient manner in which one can those of his two hands, and the result is often an inferior grade of workmanship.

Now, the peculiar behavior of the electric arc, when placed in a strong magnetic field, affords at once a simple and efficient means for welding. A dynamic attraction or repulsion occurs between the rectilinear current of the arc and the amperean currents of the field, and this results in the drawing or driving out of the arc into a point, which is very similar to the point of flame projected from a blowpipe. The form may be seen from the following sketch:



THE ELECTRIC BLOWPIPE.

The heat at the point of the arc is intense, and suffices to melt any of the metals. A piece of No. 14 copper wire held at the apex melts instantly.

This extreme heat in such a convenient form can be the means of bringing electro welding within the reach of all shops where arc lamps are employed for illumination. By a mere nominal alteration the lamp may be made to perform the double function of illumination and welding. To attain this end, a straight electro-magnet wound with coarse wire is only necessary. This is placed with one end toward the arc, and may be fixed in one position (to be determined by experiment, and depending upon the direction of the desired point of the arc), or made movable in a horizontal plane on a level with the arc. The two terminals of the magnet coil are inserted anywhere in the main circuit, or, if found necessary, may be shunted from the same. The connections, once made, can remain undisturbed, and, without influencing the main line, the lamp performs its two functions.

In the employment of the arc for electro welding, the operator must, of course, wear colored glasses for the protection of the eyes. Care must be used in the selection of these, for some of the coloring matter used (especially in blue and red glasses) absorbs the light given out at the apex of the arc, and this would be detrimental to fine work.

The electric arc, when in a strong magnetic field, exhibits another peculiarity. It is known that if a circuit, traversed by a strong current, be broken under ordinary circumstances, a moderate spark will ensue, accompanied by a snap similar to that given by a toy cap when exploded. If, however, the break be made in a strong magnetic field, an extremely large spark follows, accompanied by a peculiarly sibilant report, as intense as that of a pistol. The effect is very startling when unexpectedly made.

If a strong field be brought to bear upon the interrupter of the primary circuit of a Ruhmkorff coil, the spark emitted by the simple secondary coil equals in magnitude and length that which would be produced under ordinary circumstances were the secondary in communication with a large condenser. This simple means may often be employed to advantage in work with a Ruhmkorff, when a long spark is desirable and, at the same time, any electrostatic residue, owing to the condensers, is to be avoided.

THE PARIS EXHIBITION.

In June, 1883, a few French members of Parliament, among whom were MM. Herve-Mangon, Liouville, and Million, urged M. Herisson, minister of commerce, to consider the desirability of holding a national exhibition in Paris in 1885. Public discussions in the press and elsewhere followed, with the result that it was considered best to hold a "universal" exhibition in Paris in 1889, the centenary of the French revolution in 1779. M. Jules Ferry, who was then president of the council, considered that such an exhibition would be not alone good in itself, but tend to keep peace in Europe. On November 8, 1884, M. Jules Grevy, president of the republic, signed, upon the recommendation of M. Rouvier, minister of commerce, a decree that a universal exhibition should be opened in Paris on May 5, 1889, and should be closed on the 31st of October, in the same year. A deliberative commission was at the same time appointed to consider the best method of carrying out the project, and it recommended that other nations should be invited to take part in the exhibition, on the economical ground that it celebrated the French centennial of industrial freedom. Later on, under the Freycinet ministry, M. Lockroy, minister of commerce and industry, asked credits from the chambers for the purpose. The government resolved to leave the matter to private initiation, and that the whole cost of the enterprise should not fall upon the state, as in 1878. It pronounced, therefore, in favor of a system of organization by the state in alliance with a guarantee society, as in 1867, which had been found to work well. This society guaranteed the state eighteen million francs receipts, and gave certain guarantees in the event of the expenses exceeding the amount calculated. The society acted by means of a board of control and finances, composed of eight municipal councilors, seventeen senators, deputies, and agents of the state, and eighteen subscribers to the guarantee fund, each commissioner representing one million francs. This commission enjoys, with the state and municipal council, the right of being consulted by the minister of commerce on all questions relating to the financial aspects of the exhibition. In short, the state has control of the exhibition, the city of Paris has a voice in the control, and the guarantee society does not lose sight of its capital. The state will be reimbursed to a large extent by the great circulation of money and extra surplus from its indirect imposts. The city of Paris will be largely reimbursed by increased receipts in octroi duties, and the guarantee society is safeguarded by the receipts of the exhibition. A law, dated July 6, 1886, sanctioned this combination, and a few days afterward, on the 28th of July, a decree regulated the organization of the services. M. Edward Lockroy, minister of commerce and industry, received the title of commissioner-general of the exhibition; M. Alphand, that of director-general of the works; M. Georges Berger, that of director-general of the exploitation; and M. Grison, director-general of the finances. M. Bartet was appointed engineer-in-chief, MM. Contamin, J. Charton, and Perron have control of the metallic constructions, MM. Bouvard, Duturt, and Formige are the architects of the exhibition, and MM. Laforcade and Lion have charge of the gardens and plantations. A ministerial order, dated August 26, 1886, appointed a consultative committee of three hundred persons, under the title of the grand council of the universal exhibition of 1889, and this was subdivided into twenty-two consulting committees to watch over various departments of the works. Foreign committees, established at the request of the French government, were each invited to be represented by a delegate charged to deal with questions interesting to the nation he represented. The minister and the commissioner-general do not correspond directly with foreign exhibitors.

The ground plan of the whole exhibition, published herewith, will make clear the general arrangement. The portions devoted to exhibits from Great Britain are represented by the darkest areas. The exhibition is divided into three great parts. One part, bounded on the north by the Trocadero, is on the north bank of the Seine, and devoted chiefly to exhibits relating to horticulture and arboriculture. It is connected with the chief part of the exhibition in the Champ de Mars by the Pont de Jena, and the main thoroughfare passes under the center of the Eiffel Tower—the positions of the four feet of which are represented in the map.

In that part of the exhibition which covers the Esplanade des Invalides are many scattered buildings. One of them is for miscellaneous exhibits, and some of the others for exhibits by the French naval and military authorities. Others are for exhibits from the French colonies. Places are being built in the Seine for floating exhibits of boats and ships. Some English steam-launches are expected to be there.

At one time the plan was under consideration of connecting the Champ de Mars and the Esplanade des Invalides with a railway denoted by the dotted line, R R. Unfortunately for the public, this idea has been abandoned, and they will have to go an immense way round by the route marked W Y. This length, however, will be traversed by a railway, which will carry passengers for a small fee.

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Plan II. represents part of the palace of the Champ de Mars, which plan we copy from the *Bulletin Officiel* of the exhibition. The shaded upper part represents a portion of the great machine gallery. The galleries numbered 41 will be devoted to exhibits connected with the working of mines; 47, to leather and skins; 45, chemical products; 43, hunting and fishing appliances; 42, forestry appliances; 44, agricultural products, not alimentary; 46, bleaching and coloring; 31, linen; 39, encampment appliances; 38, arms, portable; 35, hosiery and dress accessories; 33, silks; 34, lace and lace making; 36, dresses for the two sexes; 40, toys; 37, jewelry. Returning to the upper portion of plan II., gallery 27 is devoted to heating appliances; 25, bronzes and artistic castings; 26, clocks and other time-keeping instruments; 29, ornamental leather work; 28, perfumery; 22, wall papers; 18, decoration and upholstery; 21, upholstery and tapestry; 17, these three galleries are devoted to furniture; 20, two galleries will contain specimens of ceramic art; 19, crystal and glass work; 24, goldsmiths' work; 23, cutlery; 20, mosaics. The pavilions of various Oriental nations will border this hall of miscellaneous exhibits, on that side of it nearest the Avenue de Suffren. The central portion of the lower part of the plan represents the area allotted to groups III., IV., and V., and to class 60, group VI.

By a ministerial order of August 2, 1887, an international congress of photographers will be held in Paris in connection with the exhibition; and by a resolution dated July 16, 1888, of the minister of commerce and industry, director-general of the exhibition a committee of organization was nominated to make the necessary arrangements. That committee includes the names of some men of great celebrity, including that of M. Edmond Becquerel, the chief pioneer and discoverer in relation to photography in natural colors. No great progress has been made in this research since his experiments of half a generation back. To this day such pictures cannot be fixed, and are slowly destroyed by light. MM. Paul and Prosper Henry, of Paris, who have done such good work in stellar photography, are among the members of the committee, and its president is Dr. Janssen, director of the Astronomical Observatory at Meudon, who discovered in India how to photograph the red flames of the sun without an eclipse. M. Davanne, vice-president of the French Photographic Society, is one of the most active members of the committee. The congress is expected to be held at some period between July 15 and August 15, 1889. We are indebted to the *Engineer* for the foregoing and for the plans herewith given.

U. S. GUNBOAT YORKTOWN.

The gunboat Yorktown is the first of a group of three, all similar in design. She is somewhat smaller than the Swatara class of vessels, but in offensive and defensive power and speed is immeasurably their superior.

She is a twin-screw, coal-protected cruiser, with poop and forecastle decks, with an open gun deck between.

Forward and aft, throughout the length of the vessel, is a three-eighths inch steel watertight deck, under which are placed the machinery, magazines, and steering gear. The principal dimensions of the ship are as follows:

Length between perpendiculars, 226 ft.; depth of hold, 18 ft. 9 in.; draught forward, 13 ft.; draught aft, 15 ft.; mean draught, 14 ft.; displacement in tons to L. W. L. (loaded water line), 1,703 tons; area, L. W. L., 5,765 sq. ft.; sail area, 6,352 sq. ft.; indicated horse power, natural draught, 2,200; forced draught, 3,300 H. P. Her maximum speed is calculated to be 16 knots, but it is believed she will show even better figures than these. Her crew will consist of 160 men all told.

The Plating (outside).—Garboards, 15 pounds, or about ⅜ inch; from thence to main deck, except double strakes amidships, 14 pounds; above main deck, 10 pounds. The plating up to the watertight deck is lap jointed and single riveted at the edges. Above the watertight deck, amidships, the plating is flush jointed and single riveted at the edges. All plates are double riveted at the butts. In the wake of the torpedo ports and the machine guns the plating is 40 pounds, or 1 inch thick, as a protection from the fire of an enemy's machine guns.

A conning tower, oval in shape, is built on the forecastle deck, athwartship, 7½ × 4 ft. fore and aft, 5 ft. 4½ in. above the deck, with a cover with a vertical travel of 3 inches. The tower is fitted with complete steering apparatus, speaking tubes, and telegraphs to the engine room. A handsome wood pilot house is fitted forward of the conning tower, with plate glass windows, steam steering wheel, telegraphs, etc. This pilot house is to be used in time of peace when cruising; but in an action, all manipulation of the ship will be from within the conning tower.

Her rig is that of a three-masted, fore and aft schooner. In coal endurance, the normal supply is 200 tons, but the bunker capacity is for 400 tons. This coal is disposed in the wake of the machinery and boiler, so as to give additional protection to these most invaluable adjuncts of the ship.

ENDURANCE OF THE YORKTOWN.

Speed.	Indicated horse power.	Coal. Per hour.	Coal. Per day.	Distance per day.	Coal supply of 393 tons. Distance can steam	Coal supply of 393 tons. Days.	Coal per H. P. per hour.
Knots.		Tons.	Tons.	Knots.	Knots.		lb.
16	3,300	2·60	61·7	384	2,419	6·3	1·75
15	2,620	1·75	42	360	3,366	9·35	1·50
14	2,000	1·33	31·92	336	4,136	12·31	1·50
13	1,600	1·07	25·68	312	4,773	15·03	1·50
12	1,230	0·82	19·7	288	5,750	20	1·50
10	650	0·46	11·04	240	8,542	35·5	1·60
8	375	0·26	6·24	192	12,092	62·9	1·80
6	200	0·17	4·08	144	13,870	96·3	2

The motive power is furnished by two triple-expansion engines, placed in separate watertight compartments, and develop with natural draught to 2,200 H.P., and forced draught to 3,300 H. P. The cylinders are 22, 31, and 50 in. in diameter, with 30 in. stroke. The pumps of all kinds will be driven by auxiliary engines. The two propellers are each three-bladed, and are 10½ feet each in diameter. There are four boilers, and are of the cylindrical horizontal pattern; each 9 ft. 6 in. diameter and 17 ft. 6 in. long; with a grate surface of 220 square feet.

There are two sets of dynamos to furnish a system of incandescent electric lighting throughout the ship. The search lights are of 25,000 candle power.

Armament.—The main battery is composed of six 6 in. breech-loading rifles, two on the forecastle and two on the poop, with the line of fire about 18 feet above the water. One is mounted on each side in the waist of a sponson, at a height of 10 feet from the water. The forward guns concentrate at 300 feet forward the stem, and the after two at 300 feet abaft the vessel, while three guns on one side can be concentrated at a point 100 feet from the side of the vessel. The secondary battery consists of eight rapid-fire guns and revolving cannon on the rail and tripod mounts. The Yorktown has eight torpedo guns or launching tubes, fixed ones, in the stem and stern, and three training tubes on each side. Automobile torpedoes will be fired from these tubes, and there is a complete outfit of boat, spar torpedo, gear, and charges.

The quarters for the officers are under the poop deck at the stern of the vessel, and are admirably lighted and ventilated. The crew's quarters are situated on the forward part of the berth deck, and are divided athwartship by steel watertight bulkheads, fitted with the necessary watertight communicating door. The dispensary and mess lockers are also located here. Great space and accommodation are also provided for the crew under the forecastle deck. The water closets for both officers and men are here located, as are the crew's wash rooms and galley inclosure.

Two 47 mm. Hotchkiss guns are located here, in the bow, and a large space left for the manipulation of torpedoes on each side.

The Yorktown was built at the yards of the Wm. Cramp & Sons' ship and engine building works, Philadelphia, Pa., and is now waiting for the government to give her the official trial before she can be accepted. This trial will probably be made within a few days, and it is anticipated that she will come up to the required standard, and will be put in commission at an early date. With the threatened complications in the Samoa affair, this addition to the new navy will be gladly welcomed.

Improved Polariscope.

Some improved polarizing apparatus for microscopes were exhibited and described by Dr. S. P. Thompson, at a recent meeting of the Physical Society, London. For polarizer, he uses a special prism, and for analyzer a flat-ended one of his own design. The former prism is formed from a rectangular block of spar, two faces of which are perpendicular to the optic axis; two cuts parallel to the axis are made from the middle of one side to the ends of the opposite, and the cut faces are polished and cemented by Canada balsam. A short prism with wide angle is thus obtained which can be readily fitted to the substage of the microscope. The analyzer, which consists of two wedges of spar, is mounted in a tube which fits on the eyepiece, and by recognizing that the upper end need not be larger than the pupil of the eye, the author has been able to considerably reduce the length of the prism, and still keep the bottom end large enough to collect all the rays passing through the eyepiece.

Several ingenious methods of cutting spar so as to produce prisms with minimum waste were described and illustrated by models, and a "Nicol" made by the inventor at the age of seventy-nine was exhibited.

Mr. Lant Carpenter asked the author why he condemned analyzers placed directly behind the objective; for in his experience this arrangement gave the most satisfactory results.

In reply, Dr. Thompson said his experience was decidedly different from that of Mr. Lant Carpenter, and mentioned that Zeiss had abandoned the common arrangement and now introduced his analyzers between the two lenses of his Huyghenian eyepieces.

Correspondence.

Query 22 of December 15, 1888.

To the Editor of the Scientific American:

Is there not *another* error in answer 22 of your issue of December 15, 1888?

T. B. A., in your issue of January 12, points out an error, which you state is typographical. This is evident by the solution of the equation $(500 - x) + 0{\cdot}08\,x = 200$; but I contend that the value of x, $326.09, *in this equation*, and not $340, as you state, is the *answer*.

As I understand the problem, the amount due—$500—was to be a cash payment at the time this transaction took place between A and B, but A being unable to meet his obligation, B agrees to extend the time for the payment of *a balance*, provided A will pay him *part* of the *principal*, and *the interest in advance* on the *unpaid* part.

Now, by these terms, I cannot understand how interest can be charged on the *cash payment*—$500 − x—and therefore the amount due B at the end of twelve months is simply *the unpaid balance*, $326.09.

"WALDO."

Roxbury, Pa.

[There is much probability in your statement. The only value attaching to the problem is as a question of algebra. Its wording is such that it is not easy to definitely solve it.—ED.]

Whence the Corona?

To the Editor of the Scientific American:

The solar eclipse of New Year's day has again brought up the question of the nature of the corona. Of the attempted explanations of this phenomenon, the one ascribing it to a diffraction of the sun's light on the edge of the moon seems to have found most favor, though it is not very clear how light thus diffracted can become visible as a halo without falling upon gaseous matter around the moon.

When the igneous mass out of which our satellite evolved was cast off from that of the earth to seek its own orbit, it is hardly to be supposed that it went without its due portion of those elements which, so far as they remained in a gaseous state, would eventually form an atmosphere. But astronomers say there is no evidence of a lunar atmosphere.

Many years ago the German philosopher Schopenhauer argued, from primary premises, that the moon once contained water like the earth and, since it lost its own heat, became covered with a crust of ice, which he thought accounted for the brilliancy of its reflected light. Recent speculations on the moon's constitution have led to the same rational view, so that our satellite may be said to be getting credited at least with the possession of crystallized water.

Now, the congealment of the moon's water implies the disappearance of aqueous vapors, and an atmosphere deprived of such vapors might be expected to escape detection by telescopic search, because the remaining gases, nitrogen and oxygen, would be invisible. But it may be reasonably presumed that these gases would sufficiently reflect the sun's light to be rendered luminous under the favorable conditions of an occultation, and hence likely the corona—revealing a lunar atmosphere.

A. PARTZ.

West Philadelphia, January 16, 1889.

A Providential Escape.

A miraculous escape is recorded as having taken place at the Wright Steam Engine Works, at Newburg, N. Y., a few days ago. A pulley weighing nearly eleven tons was being adjusted in a lathe, when suddenly the chain by which it was suspended parted, allowing the wheel to fall into the pit below, a distance of eight feet, where it was broken into eight pieces. At the time the chain parted, one of the turners was standing on the hub of the wheel and was precipitated into the pit below. Those who witnessed the accident rushed to the spot, expecting to find him crushed beneath this enormous mass of iron, but he was discovered alive and sound, although the pit was only five feet wide. Of course the shock was severe, but he was entirely uninjured, save for a few scratches received from flying fragments. With a little help he was able to climb out of the pit, when he was warmly received and congratulated by his friends and co-workers.

The Book Camera.

Kruegener's book camera is a veritable detective. One might be meekly walking along the road, or mixing with the devout going to or coming from church (on a week day, of course), with this innocent-looking, yet really formidable, apparatus in his hand or under his arm, and no one would suspect its nature, for to a casual observer it is a book and nothing more. Yet does it really contain, stored away in its interior, no fewer than two dozen small plates, 1⅝ inches square, each of which can be brought in rotation to the focusing plane, exposed, deposed into a separate receptacle, and another plate made to take its place, and all this by the simple act of pulling out a small handle, pushing it in again, and pulling a string.—*Br. Jour. Photo.*

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REMARKABLE EXPLOSION OF A LOCOMOTIVE.

To the Editor of the Scientific American:

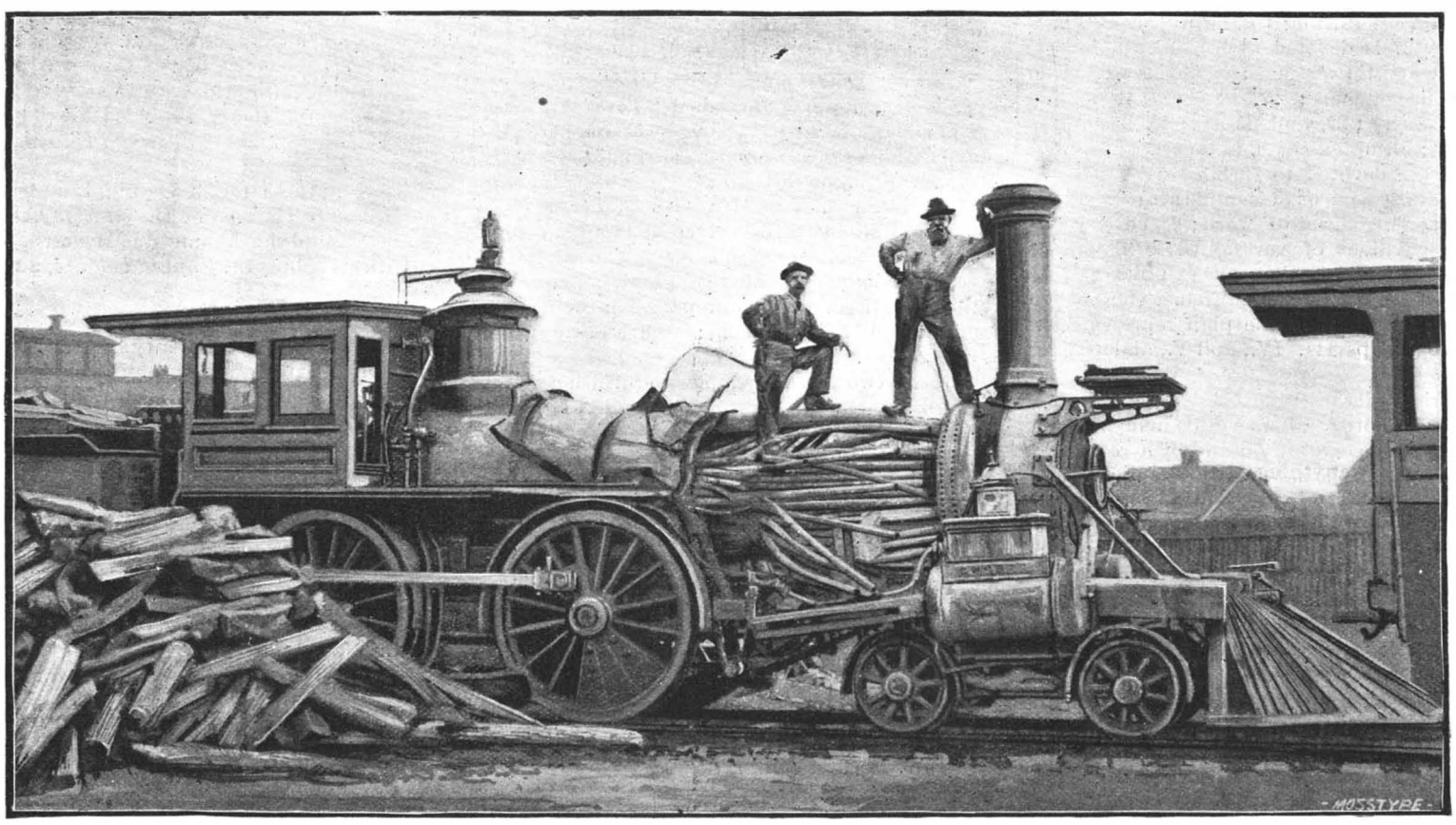
Thinking the readers of the SCIENTIFIC AMERICAN might be interested in a rather remarkable boiler explosion which happened to locomotive No. 52 on the C., W. & B. R.R., on the morning of the 24th of December, 1888, I inclose you a photograph of the engine, which I took the day after the explosion.

No. 52 is one of the old Rogers engines, and had been in use for about twenty-four years. At the time of the explosion, which happened about one mile west of Blanchester, Ohio, she was pulling a passenger train at a speed of over thirty miles an hour, and, strange to say, she did not leave the track, although the explosion tore the barrel of the boiler completely off from the smoke arch to the wagon top. It started on the left side and tore over the top to the right, the sheet there blocking the driving wheels so they could not turn, and destroying the air brakes, so that the engineer, Ed. Rother, and fireman, Oscar Hodson (neither of whom was hurt in the least, although both were covered with soot and dirt), had to climb back over the tank and brake the train by hand. The explosion was heard for five miles, and the shock was so great that it jarred the lids off the stove in a house near the track where it happened. A piece of the bell was found over a quarter of a mile from where the explosion happened.

The two men in the picture are the engineer and fireman.

Hoping these facts may interest you, I remain, as ever, an interested reader of your valuable paper, which I have taken for several years. CHAS. P. GILMORE.

Chillicothe, O.



EXPLODED LOCOMOTIVE No. 52, CIN., W. & BALT. R.R.—[FROM A PHOTOGRAPH BY CHAS. P. GILMORE.]

A CONTINENTAL VILLA.

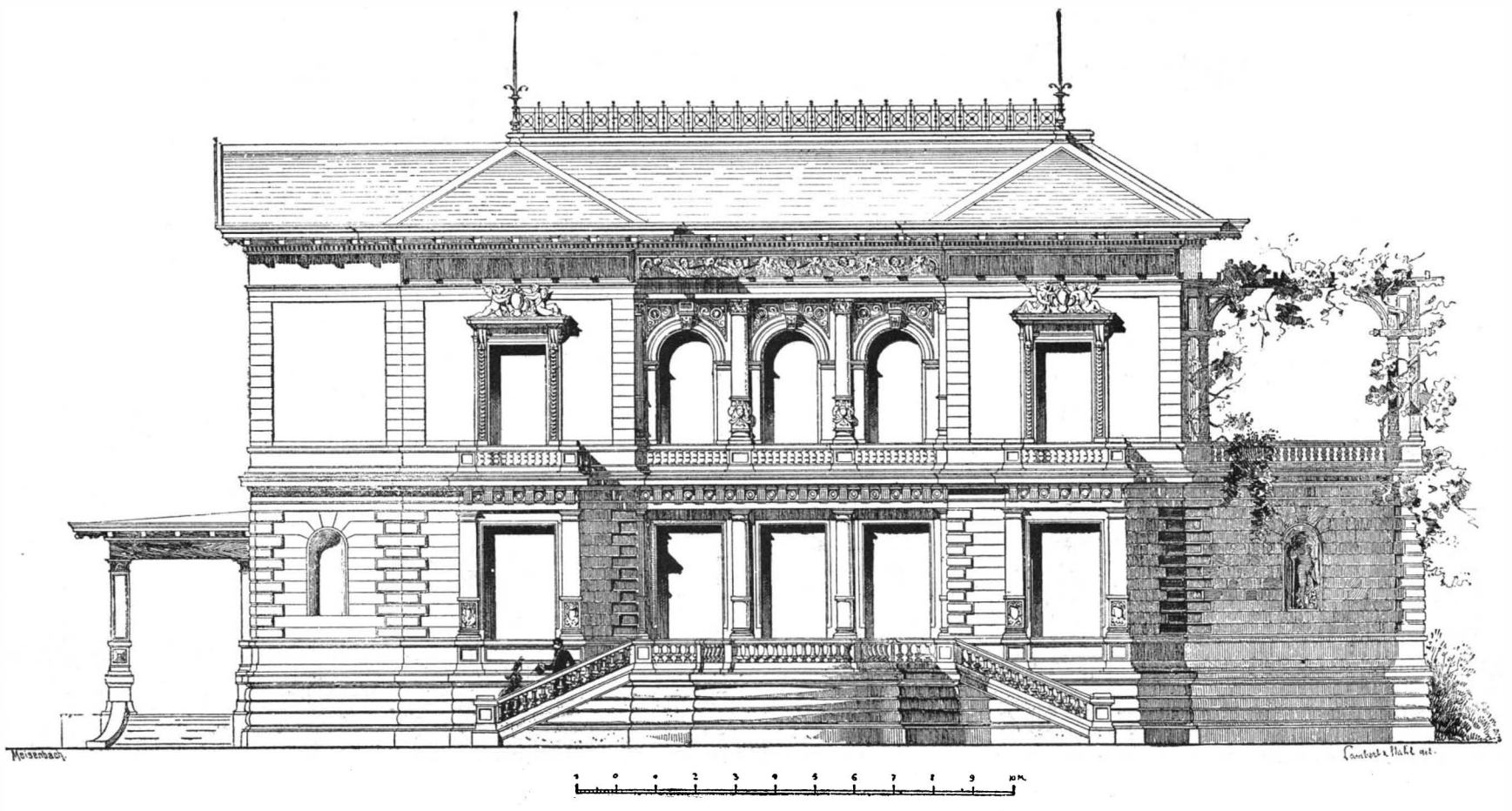
We reproduce, from an early number of our ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN, the illustration of a simple and unique design of a dwelling house or villa in the classical style of architecture. The design is very simple, and unlike most of the country houses which have been built in this country; and we would suggest that, for large towns or small cities, a house of this description would be well adapted and strikingly ornamental. It would certainly attract attention from its unusual appearance, and an architect could enlarge the house and arrange the interior to suit the taste and convenience of a large or a small family, preserving the architectural design, which is unusually attractive.

The *Architektonische Rundschau*, in which publication the engraving first appeared, stated that Puttfarcken and Janda, of Hamburg, were the architects, and that the villa was erected at Wandsbeck, Germany, in 1886.

The kitchen and store rooms are in the basement, and on the first floor are the living and drawing rooms, dining room, etc. The upper story contains only sleeping rooms. The owner gave directions for the arrangements of the plans, according to which seven rooms of the first floor were to be connected, in consequence of which the entrance and the vestibule had to be included in one room. The interior is finished in stucco, and the dining room, billiard room, and library are provided with wooden panels and wooden ceilings. The ceilings of the other rooms are plastered and richly frescoed. All the furniture and decorations were made from plans drawn by the architects. The cost of the building was about $40,000, and of the furniture about $20,000.

Magnetic Purification of Clay.

Electricity is being more and more used for the purification of kaolin and other porcelain clays. The clay is sifted on to a rapidly revolving horizontal plate, which is surrounded with powerful electro-magnets, which retain the particles of iron. From this the clay passes to a second plate which removes the last traces. The process is said to be comparatively cheap and very rapid, and since its introduction many clays hitherto rejected as containing too much iron have become of value for the manufacture of pottery.



A CONTINENTAL VILLA—PUTTFARCKEN & JANDA, ARCHITECTS.

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SIMPLE EXPERIMENTS IN PHYSICS.

BY GEO. M. HOPKINS.

The enormous pressure developed in a hydraulic press is a subject of wonder, even to those who perfectly understand the principle involved in its operation.

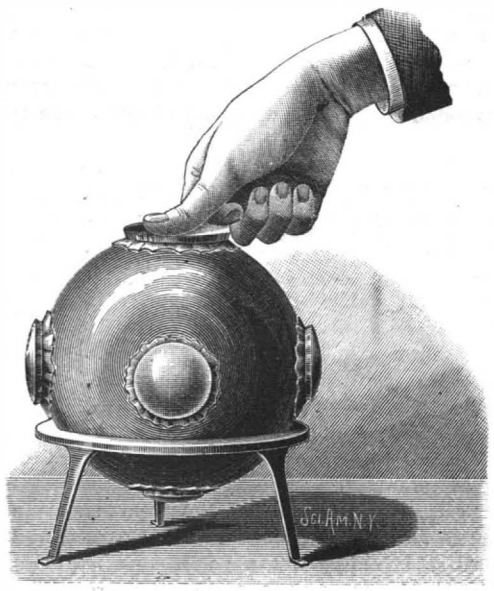

Fig. 1.—DEMONSTRATION OF PASCAL'S LAW.

Men regard with interest anything that furnishes an exhibition of power, and it is difficult to avoid thinking that in the hydraulic press power is actually created in some mysterious way. However, nothing of this kind happens. A hydraulic press is simply a power converter, in which a certain pressure per square inch, acting on a small area, is able to produce the same pressure per square inch on a large area, thereby multiplying the pressure. The sum total of all the power utilized in the press is exactly equal to the sum total of all the power applied to the press, less friction.

Before proceeding with the hydraulic press it will, perhaps, be well to examine some of the principles which underlie its operation. A hollow metallic globe (Fig. 1) is provided with openings, at the top and bottom, and upon four or more of its sides. Around these openings there are collars, over which are stretched and tied diaphragms of rather thick but elastic rubber, the upper diaphragm being omitted until the globe is filled with water. The globe being placed upon a suitable support, pressure is applied to the upper diaphragm, when it is found that the pressure is transmitted through the medium of the water not only to the diaphragm at the bottom of the globe, but in an equal degree to the diaphragms upon the sides of the globe, thus showing that the pressure is exerted by the water equally in all directions, and at right angles to the surfaces with which it is in contact. This is a simple illustration of Pascal's law.

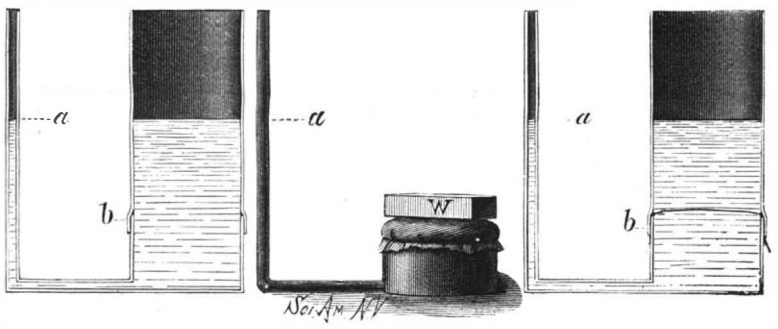

Fig. 3. Fig. 4. Fig. 5.

Probably there is not a more striking example of the effects of hydrostatic pressure than that presented in Pascal's experiment, in which he burst a stout cask by inserting in it a tube about 30 feet high, and filling both the cask and tube with water. This experiment, in a modified form, is illustrated by Fig. 2. A tin cup of 6 inches diameter, and having a wired edge, is furnished with a leather or rubber cover, tied over the top of the cup so that it may have a motion of a half inch or so. In the side of the cup is inserted a tube which extends upward above the top of the cup 24 inches, and is furnished at its upper end with a funnel. The diameter of the tube is of no consequence; the result will be the same whether it is small or large. The cup is filled with water by submerging it with the tube in a horizontal position, with the tube uppermost, and alternately pressing in the flexible covering and then drawing it outward. This operation soon drives out the air and fills the cup with water. The cup is placed with the pipe in a vertical position, and a board is laid over the flexible cover and pressed to expel all of the water above the rim of the cup.

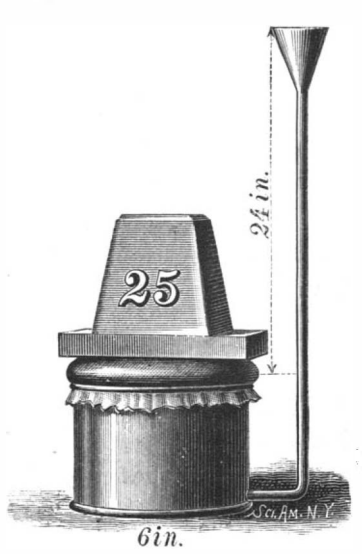

Fig. 2.—PASCAL'S EXPERIMENT.

Now, by placing a twenty-five pound weight upon the board and pouring water into the tube, the weight will be lifted and sustained. This experiment shows that a great pressure may be produced by a small column of water. In this case the cup, with its flexible cover, represents the large cylinder and piston of a hydraulic press, the tube stands for the pump cylinder, the small water column in the tube for the piston, and the weight of the column for the power applied. By increasing the height of the water column, the pressure will be correspondingly increased.

Fig. 3 shows two communicating vessels of different diameter. The larger one is divided at a point, *b*, near its base, and reunited by means of a packed joint. When water is poured into one of these vessels, it rises to the same level in both. By removing the upper portion of the larger vessel and tying a flexible cover over the lower part, it is found that a column of water in the smaller vessel extending to the point, *a*, will be exactly counterbalanced by a certain weight placed on the flexible cover, as in Fig. 4. The weight required will be exactly that of a column of water of the diameter of the larger vessel and equal in height to the distance between the flexible cover and the level of the smaller column, *a*. This may be shown by removing the weight, replacing the upper part of the larger vessel, as in Fig. 5, and filling it with water up to the level, *a*. The weight of water required in the larger vessel to thus lift the smaller column to the point, *a*, will be found to be the same as that of the weight removed.

It seems paradoxical that no variation in the size or form of the upper portion of the larger vessel can make any difference in the results, provided the same water level is maintained; but it must be remembered that the whole question is simply one of pressure per square inch. The weight will as readily balance a large column as a small one, the vertical height being the same in each case.

In Fig. 6 is illustrated a hypothetical hydraulic press, above which is given a diagram showing the relative areas upon which pressure is exerted. To the two square communicating vessels, A, B, are fitted the pistons, *a*, *b*. The piston, *a*, is one inch square, and consequently has an area of one square inch. The piston, *b*, is five inches square, and consequently has an area of twenty-five square inches. If the spaces below the pistons be filled with water, it will be found that, in consequence of the equal distribution of pressure throughout the confined body of water, a weight placed on the piston, *a*, will balance a weight twenty-five times as great placed upon the piston, *b*; that, for example, a downward pressure of five pounds upon the piston, *a*, will, through the medium of the water, cause a pressure of five pounds to be exerted on every square inch of surface touched by the water, and that the movable piston, *b*, having twenty-five times the area of the piston, *a*, and receiving on each square inch of its surface a pressure of five pounds, will be forced upward with a pressure of one hundred and twenty-five pounds.

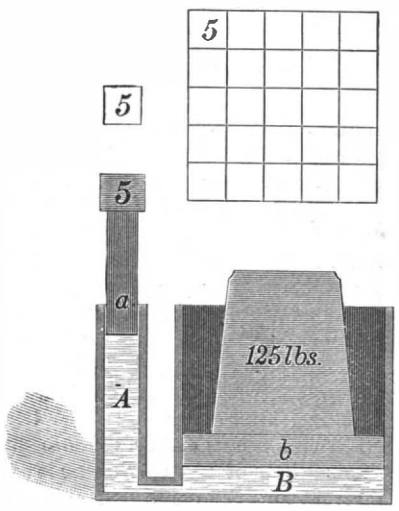

Fig. 6.—PRINCIPLE OF HYDRAULIC PRESS.

A press of this description would have no practical value, inasmuch as a movement of the piston, *a*, through the space of five inches would lift the piston, *b*, only one-fifth of an inch. To lift the piston, *b*, five inches would necessitate a piston, *a*, having a length of one hundred and twenty-five inches (over ten feet).

To obviate this difficulty, the pump piston of a hydraulic press is of a reasonable length, and valves are provided by means of which the short piston, by acting repeatedly, will accomplish the same results as would, in the other case, require a very long piston.

In Fig. 7 is shown a very simple and easily constructed hydraulic press, which has considerable utility. It is made of pipe fittings, valves, rods, and bolts, that are all procurable almost anywhere.

To the baseboard is secured a flange, into which is screwed a short piece, A, of gas pipe. On the upper end of the pipe is screwed a coupling, into which is inserted a bushing, from which the internal thread has been removed. In the bushing and in the pipe, A, is inserted a rod of cold rolled iron, a bar of brass, or a short section of shafting, and the space in the coupling around the rod is filled with hemp packing, which may be compressed, as required from time to time, by screwing in the bushing. The flange at the bottom of the pipe, A, is connected with the pump, B, by the pipe, C, in which is inserted a discharge, as shown. The pump cylinder is inserted in a crosstee, to opposite sides of which are attached ordinary check valves. The tee is fastened to the base by a plugged piece of pipe, extending through the base and provided with a nut, which clamps the base tightly. The barrel of the pump is in all respects like the press barrel, except in size. The piston consists of a ¼ inch brass rod, to the upper end of which is attached a T-handle.

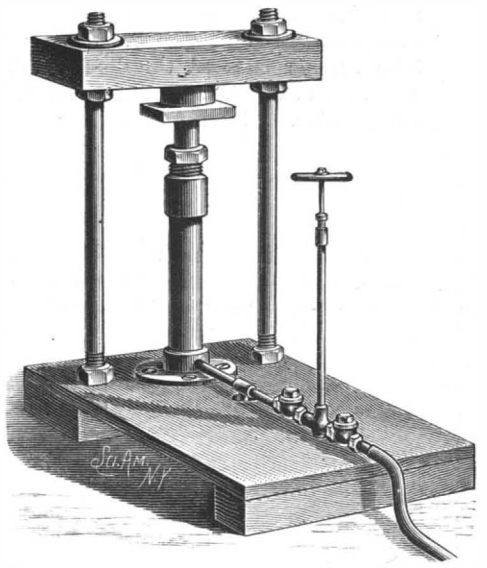

Fig. 7.—SIMPLE HYDRAULIC PRESS.

A heavy bar of wood is supported over the pipe, A, by bolts extending through the base and through a reenforcing bar under the base. The check valves both open toward the cylinder, A, and the outer one is provided with a rubber suction pipe. Water is drawn into the pump by lifting the piston and forced into the press barrel by the descent of the piston. The proportion of the pressure attained to the power applied will be as the area of the large piston to the area of the small one. With pistons of respectively 2 inch and ¼ inch diameter, a pressure of 3,000 pounds may be produced easily. If it is desired to create a greater pressure, the barrel, A, may be made of hydraulic tubing, and a lever may be applied to the pump piston.

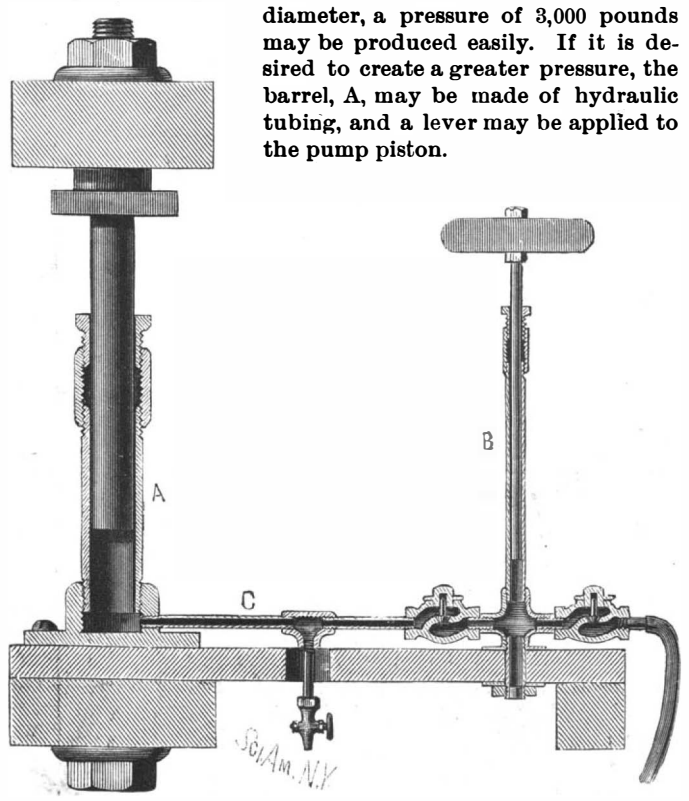

Fig. 8.—SECTIONAL VIEW OF SIMPLE HYDRAULIC PRESS.

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Russian Sheet Iron.

The inquiries we receive from time to time respecting Russian sheet iron demonstrate that there is a demand for that article which is badly supplied, as well as a good deal of ignorance respecting the method of its production. It is generally supposed that the mode of manufacture is a dark secret, which cannot be penetrated—indeed, quite recently, a newspaper paragraph has been in circulation in which it is asserted that Russian sheet iron is produced in a huge walled town, from which no workman is ever allowed to depart alive. This statement is an absurdity on the face of it. As a matter of fact, there is no particular secret in the matter, seeing that Dr. Percy described the process a great many years ago, and quite recently Mr. F. L. Garrison has contributed a paper on the subject to the United States Association of Charcoal Iron Workers. Mr. Garrison visited the works in the Ural district of Russia and saw the sheet iron made; consequently his paper possesses unusual value and interest to all producers and users of fine sheet iron.

The ores used are chiefly those from the Maloblagodatj mines, the chemical composition being: Metallic iron, 60 per cent; silica, 5 per cent; and phosphorus, 0·15 to 0·06 per cent. The ore is either made into malleable iron in various kinds of bloomaries, or is smelted into charcoal pig iron, and then puddled or dealt with in a Franche-Comté hearth. The blooms or billets are rolled into bars 6 inches wide, ¼ inch thick, and 30 inches long. The bars are first assorted, and the inferior ones rerolled. Those accepted are carefully heated to redness, and cross-rolled into sheets about 30 inches square, the process necessitating from eight to ten passes through the rolls. The sheets thus obtained are again twice heated to redness, and rolled in sets of three each, great care being taken that every sheet before being passed through the rolls is brushed over with a wet broom made of fir, and at the same time powdered charcoal is dexterously sprinkled between the sheets. The sheets receive ten passes through the rolls, and are then trimmed to a standard size of 25 by 56 inches. They are then further assorted, the defective ones being thrown out, each sheet is wetted with water, dusted with charcoal powder, and dried.

That done, they are made up into packets containing 60 to 100 sheets, and bound up by the wasters. The processes of annealing and finishing are thus described by Mr. Garrison:

"The packets are placed, one at a time, with a log of wood at each of the four sides, in a nearly air-tight chamber, and carefully annealed for five or six hours. When this has been completed, the packet is removed and hammered with a trip-hammer, weighing about a ton, the area of its striking surface being about 6 by 14 inches. The face of the hammer is made of this somewhat unusual shape in order to secure a wavy appearance on the surface of the packet. After the packet has received ninety blows equally distributed over its surface it is reheated, and the hammering repeated in the same manner. Some time after the first hammering the packet is broken and the sheets wetted with a mop to harden the surface. After the second hammering the packet is broken, the sheets examined to ascertain if any are welded together, and completely finished cold sheets are placed alternately between those of the packet, thus making a large packet of from 140 to 200 sheets. It is supposed that the interposition of these cold sheets produces the peculiar greenish color that the finished sheets possess on cooling. This large packet is then given what is known as the finishing or polishing hammering. For this purpose the trip-hammer used has a larger face than the others, having an area about 17 by 21 inches. When the hammering has been properly done, the packet has received sixty blows equally distributed, and the sheets should have a perfectly smooth, mirror-like surface.

"The packet is now broken before cooling, each sheet cleaned with a wet fir broom to remove the remaining charcoal powder, carefully inspected, and the good sheets stood on their edges in vertical racks to cool. These sheets are trimmed to regulation size (28 by 56 inches), and assorted into Nos. 1, 2, 3, according to their appearance, and again assorted according to weight, which varies from 10 to 12 pounds per sheet. The quality varies according to color and freedom from flaws or spots. A first-class sheet must be without the slightest flaw, and have a peculiar metallic gray color, and on bending a number of times with the fingers, very little or no scale is separated, as in the case of ordinary sheet iron."

It is the peculiar feature of Russian sheet iron to possess a beautifully polished coating of oxides—what the Germans term "glanz"—and it is in securing that finish that the makers and workmen excel. The trade has been in the same hands for a very long series of years, and the men naturally possess the accumulated skill of generations of their predecessors. It must be remembered, also, that the iron ores used are very pure, containing but small traces of phosphorus and no sulphur, and that they are smelted and the product heated exclusively with wood fuel. It is not very easy to understand the exact effect of the powdered charcoal, nor the effects of the interposition of the cold finished sheets between those not yet cold. Mr. Garrison says that the Russian ironmasters attribute the excellence of their product to these peculiarities of treatment, and he seems convinced that there is no secret about the process. If he is right, then, it would seem to follow that there ought to be no special difficulty—given similar materials and fuel, and with the same methods of procedure—in turning out sheet iron as good as the Russian article in this or any other country. In view of the demand for Russian sheet iron, it might pay some of our sheet rollers to make the experiment at all events.—*The Ironmonger (London).*

Endurance of Wood Posts in Fires.

The contents of a building, says E. M. Shaw, in the *Architect* (London), have undoubtedly much to do with its safety or danger, but, in estimating the whole risk, the materials of which the building is constructed must never be put out of consideration. Every building cannot be erected with brick columns and groined arches, but there is a vast range between these and the miserable cast iron posts too commonly to be seen, many of which have been put in without having been tested for strength even at the ordinary temperature of the atmosphere, much less at that of a fire. The following illustration may be given of a fact well known to all firemen of experience, but seldom proved to demonstration for those not specially interested.

A fire occurred in a warehouse of enormous proportions, and raged with great fury for five hours, at the end of which time it was extinguished, and a very large proportion of the building and its contents saved. The warehouse was constructed of brick walls, it had wooden floors supported on wooden beams, which in their turn were carried on wooden story posts about 12 inches thick, and, although serious damage was done, not one portion of the heavy woodwork was destroyed. After the fire the proprietors allowed the chief of the fire brigade to remove one of the story posts, with a section of the beams and other parts surrounding it above and below.

This post had been subjected to the full action of the fire during the whole of its duration, as already mentioned, or, making full allowance for everything, including the delay of the fire attacking the particular spot on which it stood, and the time at which the cooling process commenced, certainly not less than four and a half hours. As large quantities of water had been used, and it was probable that everything had been saturated, the wood was carefully dried before a strong fire until not a trace of moisture remained in it.

It was then set on end in an open yard, exactly as it had stood in the warehouse, with the pedestal underneath, the cap above, and the beam across the cap, more than a ton of shavings, light wood, and heavy wood were placed round it, and after the whole heap was saturated with petroleum a light was applied to it, and, after this, large quantities of petroleum and turpentine were pumped on it. At the end of two and a half hours the post, beam, and other parts were withdrawn from the fire, and within a few minutes from the time they were withdrawn they ceased to burn. A few feet were then sawn off horizontally, at that part which had suffered most from the flames, and afterward the same piece was split longitudinally with steel wedges, in order to examine its condition.

The post was of pitch pine, about the most inflammable wood known, and yet after exposure for seven hours to fires, the fury of which could not be exceeded except in blast furnaces, it contained within it a quantity of perfectly uninjured and apparently fresh wood, probably capable of supporting the whole weight which the original post was designed to carry. Immediately after the saw cut, and again after the cleaving with steel wedges, the center was carefully examined, and found to be just perceptibly warm to the touch, but nothing more, thus proving that the fiber, in which the strength lay, was quite uninjured.

[PHOTOGRAPHIC TIMES.]

Bleaching Blue Prints.

An original method of procuring a beautiful tone and detail with the ordinary blue prints is certainly an accessory to the amateur photographer.

I hardly expect to go into an explanation of the preparation of the paper—it is not necessary in this case; suffice to say that almost any solution that you may make up and spread on the paper for blue prints can be treated by this bleaching process with the same effect as the ordinary stock paper that is sold at the stationers' or photographers' stock houses.

To get the prettiest tone in the blue print it is necessary to overprint—that is, to expose the print much longer than in making an ordinary blue print—and, after a thorough washing in running water, procure a tray, say 8×10, for small (4×5 or 5×7) prints, and put in eight ounces of the following bleaching mixture:

Aqua ammonia	1 drachm.
Water	8 oz.

Lift the blue prints from the water and place in the bleaching solution carefully, so as to cover the entire print. The action is rapid, and the print on immersion immediately takes on a purplish hue, which is very beautiful for certain effects. The print will then gradually fade away, changing to almost the original coloring, and if allowed to remain in the solution the blue will bleach out entirely, leaving no trace of the blue solution on the paper.

The operator must use his own judgment as to the proper time to stop the bleaching, and he can readily judge that by watching the print fading away, and remove it immediately when he has procured the proper tint.

I would advise overprinting for the reason that the half tones and the beautiful detail so often found in the shadows of a silver print are not to be had on an ordinary blue print unless it is overprinted. This gives the operator an opportunity to judge, by actual observation during the bleaching process, the proper time to remove the print. Immediately after taking it out of the bleaching solution, place the print back into the running water and wash for a short time, so as to remove any trace of the ammonia.

If this solution bleaches your prints too quick, add a little more water, or if it acts too slow, add a few drops of ammonia.

I would advise the use of the weak solution, as it gives one an opportunity to handle the prints better, and it seems to have a better effect on the prints.

In special cases, where you wish to remove a blue spot or blemish of any kind, take a small brush and paint over the blemish with a mixture of ammonia and water. High lights can be readily brought out in this manner, which, if properly handled, has a very desirable effect.

For the use of photo-engravers a very cheap and desirable method to obtain correct drawings is as follows:

After the blue print has been washed and toned down to the proper coloring, take a drawing pen or brush and with indelible drawing ink draw the necessary lines for the engraving on the print, and after the ink is well dried, place the print in the bleaching solution and allow it to remain until the blue tint is entirely removed.

This will give you a pure white paper and clean black lines. The bleaching solution will have no effect on the indelible ink.

Oxalic acid or cyanide of potassium in solution will bleach blue prints, but usually leaves a yellow tint on the white parts, which is undesirable, let alone the danger of handling or using these poisonous chemicals. —*John E. McCrickart.*

Electric Railways and Motors.

The electric street railway in the city of Boston, being built under the Bentley-Knight and Sprague patents, is nearly completed. It will be ready for operation soon, in time to test the feasibility of those systems amid the ice and snow of the Boston climate, which is particularly bad for subways, owing to the rapid variations in temperature, which give rise to large quantities of slush and sleet—the two evils against which electric railways will have to contend. If this road operates successfully in Boston this winter, the feasibility of the devices with which it is fitted will be well established.

The electric street railway to be built in Fulton Street, New York City, is progressing slowly. The street is broken, and the details of construction are lying around in great confusion. The delay is probably caused by the proverbial wire pulling with which New Yorkers are so well acquainted.

We notice an increase in the demand for electric motors to be used in driving isolated machinery. Among the recent orders is another for driving transfer tables. This makes the third electric application of this nature now in successful operation.

There is a complaint against the use of dynamos run by separate engines in the front car of passenger trains for the purpose of lighting the cars with electric light. It is stated that the vibrations of such dynamos and engines shake the cars considerably, and by some it is further stated that the pulsations can be perceived at the rear of the train. There is a demand for a well balanced engine and dynamo connected directly together, for the purpose of lighting passenger cars, and it is wholly inexcusable that such machinery should be so badly out of balance as to shake the train. In this connection it may be well to state that so far the systems adopted for electric lighting in our through trains have been such as to require the use of the small stationary engine during the whole day and night, in order to store sufficient current for use during the short time the lights are lighted. It does seem that our electricians should offer something better than this.—*The Railway Review.*

A PINT of warm water taken on an empty stomach in the morning is the safest and surest of all remedies for habitual constipation. It dissolves the fecal matter and stimulates peristaltic action, thereby giving a normal action without pain. If the tongue is coated, squeeze a lemon into the water and drink without sweetening.

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RECENTLY PATENTED INVENTIONS.

Engineering.

EXHAUST NOZZLE.—John H. McIndoe and William Meredith, Mount Pleasant, Pa. This is a nozzle adapted for the smoke box of a locomotive engine, with sliding block for controlling the capacity and top opening, which does not, when fully adjusted inward, lap over the opening below it to baffle the escaping steam, but insures a free or uninterrupted discharge from the channel through the nozzle.

Railway Appliances.

DUMPING CAR.—Ferdinand E. Cancla, New York City. This car is of the kind having one or more discharge apertures in its floor, closed by sliding doors, the invention covering novel features whereby the sills are kept intact, and serve to carry the door, and whereby great strength and thorough efficiency are secured.

SINGLE RAIL RAILWAY.—Rufus H. Brown, Peabody, Mass. This invention provides means and mechanism whereby the car is not only supported in upright position, but is allowed a certain amount of play vertically and laterally, that it may ride over obstacles and inequalities, springs being arranged in different positions to effect such object.

Mechanical.

COTTON COMPRESS.—George Taylor, Hillsborough, Texas. This press has opposing sets of toggle levers, one set connecting each end of the sliding platen with the frame, the duplicate sets of toggles being each united to the stud of the piston by single links, making a simple and efficient device, securing economy in power and in construction.

CONVEYING BELT.—Daniel Brennan, Jr., Saltersville, N. J. This belt is made of a pair of endless ropes, covered, connected, and held apart throughout, by narrow metallic bars or wires looped over and upon them, and is capable of being driven by ordinary machine pulleys, the cross bars and attachments being of shapes to form sides, flights, buckets, etc., upon the belt, to adapt it to work horizontally, vertically, or at any required angle, to convey materials and transmit power.

MOTION CONVERTING MECHANISM.—John De Monnin, Corvallis, Oregon. This mechanism is specially designed for application to a steam engine, to convert rectilinear into rotary motion, and comprises a swiveled or pivoted cam or lever, combined with and engaging in opposite directions spiral grooves in a cylinder applied to a shaft, with stationary or fixed cams for shifting or switching the pivoted cam.

BUSH HAMMER.—Luther H. Rowell, South Thomaston, Me. This is a hammer for dressing stone, in which two pole plates are used, with integral shank sections, united by a sleeve, which forms a socket for the handle, the cuts being made in the form of long blades, each in one piece, extending between and beyond the pole plates, the plates and cuts being held together by transverse bolts.

SEAMLESS PULP TUBES.—Horace J. Medbery, Ballston, N. Y. This invention covers a peculiar construction and arrangement of parts in a machine adapted to form straight sections of seamless tubes, pipes, or other analogous articles of a uniform diameter throughout, of paper or wood pulp.

ELEVATOR INDICATOR.—Oliver C. Hayward, New York City. Within the elevator shaft, or in a casing auxiliary thereto, the several indicators are pivoted, and adapted for engagement with the car, the invention providing a simple and economical attachment whereby the approach of the elevator from above or below will be indicated and its position shown.

Agricultural.

PLOW.—Jeremiah R. White, Raymond, Miss. This plow has a reversible scraper blade, made of oblong diamond form and cylindrical in curve, so that all the corners will touch a flat surface, and having a central bolt hole and indentations or gashes on either side of the center, whereby the scraper can be adjusted to trim off the row between the bar of the plow and the plants.

FEED TROUGH.—Martin V. B. Stevenson, Jesup, Iowa. The main feed receptacle has a laterally swinging U-shaped agitator, which is operated by the horse or other animal bringing its nostrils close to the bottom of the feed trough, whereby the grain or feed is fed to the trough in limited quantities, and the animal will be compelled to feed slowly.

HARVESTER AND THRASHER.—Lester A. Gillett, Leonardville, Kansas. The cutter bar is carried by a swinging frame which the operator can raise and lower or lock in position, according to the depth to which the grain is to be cut, the grain being fed into the front open end of the thrashing machine by a belt, the straw, after thrashing, passing out of the rear of the casing, while the kernels are passed through a chute into bags.

CORN CUTTER.—George W. Gibson, Kimbolton, Ohio. The frame of the machine has side extensions forming horizontal tables on which the cornstalks cut by knives fitted at the front edge of the tables fall as the cutter is drawn forward, while the machine has an attachment by which shocks are readily formed after enough stalks have been cut for the purpose.

HAND PLANTER.—Wilber S. Wikle, Union, West Va. This planter has two vertical arms, hinged at their lower ends by plates, the arms having at their sides metal casings adapted to project downward to form a chute or mouth which is opened as the arms are brought together and closed as they are drawn apart, with other novel features, whereby corn and beans may be planted at the same time and fertilizer simultaneously distributed.

Miscellaneous.

CARTRIDGE LOADER.—James V. Thompson, Fort Madison, Iowa. The device has a powder and a shot magazine and a wad box, and is adapted to fill either a paper or metal shell, regulating the amount of charge as desired, while it is durable in construction and may be expeditiously and conveniently manipulated without danger of exploding the primer.

ATTACHING EYEGLASSES.—William H. Brownlow, Brockville, Ontario, Canada, and Joel S. Warner, Ogdensburg, N. Y. A plate is secured to the under front surface of the visor or brim of a hat, and eyeglass frame and lazy tongs connected therewith, in such way that the glasses may be easily drawn downward and adjusted, or will be held out of the way, against the hat brim, when moved upward.

CHALK HOLDER.—Fannie Chambers, New York City. Within the holder is an operating screw rod, on which is mounted a traveling nut, and a chalk-holding clamp, to firmly hold the chalk as it is projected out of and withdrawn into the casing by the operation of the screw rod, the device being for use with tailor's chalk, the holder feeding the chalk down as its edge becomes worn.

HEAT RADIATOR.—Asa C. Edwards, Westfield, Mass. It consists of a heating drum having transverse rotary tubes with open ends, the apparatus being provided with means by which the dampers of the radiator may be automatically opened and closed and the radiator tubes be cleansed from soot.

GATE.—Joseph Albers, Wells, Oregon. Combined with a pair of pivoted gates are pivoted opening levers and a rod connected to the pivots of the gates, with other novel features, whereby the gates may be opened for the passage of teams, and closed, without the dismounting of the driver, or the gates may be held in open position.

GATE.—Hiram S. Harris, Cincinnati, Ohio. This invention relates to sliding gates operated by levers actuated by persons passing, and provides simple and positively acting devices by which the gate may be slid open or shut easily, and without derangement of the levers, pull cords and drum.

VEHICLE SHAFT.—William B. Farrar, Greensborough, N. C. This shaft has a peculiar joint in its length that permits its position to be changed laterally and the shaft tightened up in a new position, to increase or diminish the space between the shafts, to adapt them to larger or smaller horses.

HAME TUG.—George W. Moliere, Ocean View, Cal. It has a hollow leather casing for the reception of the entire end of the trace, a metal eye or clip with shanks extending along the inside of the casing, with space for the tug and a set screw, the extended shanks and the trace, so that there is no projecting end of the trace, the latter being neatly housed.

END GATE.—Frank S. Sears, Atkinson, Ill. This is a wagon end gate, resting on a projecting strip or ledge at the rear end of the wagon body, and connected to the body by metallic straps and hooks, so that the gate can be readily opened and held in horizontal position, or swung beneath the body, or so that a part only of the end gate may be opened.

WHIP SOCKET.—Herbert Elder, Harrisburg, Pa. Combined with the whip socket are attaching plates, between which an arm is pivoted having a projection on its inner side, and a vertically sliding hook or catch, whereby a whip may be securely held and locked, the whip being clamped against the interior wall of the socket.

MILLSTONE DRESS.—Joseph H. Brown, Social Circle, Ga. This invention provides a millstone dress with auxiliary transverse furrows to check or retard the progress of the partially ground material and prevent it from passing too rapidly from the eye outward, making a combination dress for use with wheat and corn, middlings, and all varieties of grain, and with which the stone can be run rapidly and will keep cool.

ASH SIFTER.—Edward E. Smith, New York City. The stove, below its grate and base flange, is made a little deeper than usual, to accommodate the sifter devices and give room for the ashes and cinders, which are discharged into two separate compartments at opposite sides of a partition across the bottom plate, and the invention covers novel features of construction in a sifter adapted for use in such place.

SASH FASTENER.—John G. Erickson, Hadley, Minn. This is a sash fastener and holder, consisting in a casing having an inclined locking bolt, to lock the sash when closed, and a vertically and outwardly movable friction holder for holding the sash open at any desired height, the device being automatic in its action, strong and durable, and having no springs.

STEERING DEVICE.—Charles D. Wooley, Walden, N. Y. This invention covers an auxiliary steering device to be readily arranged for use in case of accident to the main steering gear, the vessel being made with a downwardly opening rudder recess, at the rear part of the keel, in which is secured a vertically adjustable rudder post carrying a rudder, the construction being such that the rudder can be retracted wholly within its recess or projected completely below the bottom of the vessel.

LAMP COVERING.—George H. Dean, St. Louis, Mo. This covering is for inclosing the glass globes of incandescent lamps while out of use, and consists in a case formed of two similar hollow halves, a hinge connecting the lower ends of the halves with a spring bearing on the halves at their hinged ends and holding them normally closed.

HEAD PROTECTOR.—George H. Chappell, William Brown, and John Brown, Brownton, Minn. This protector consists of a ring with sliding ribs, supports, shoulder pieces, web and covering, adapted to be worn upon the shoulders and around and over the head, to protect the face and neck of the wearer in inclement weather.

FIRE ESCAPE.—John D. Rullmann, San Antonio, Texas. This escape consists of an extensible tower having a series of platforms, a series of lifting toggle levers arranged in pairs as lazy tongs at the four corners, with a series of bracing toggle levers arranged to work reversely to the lifting toggles, the construction being also adapted for use as an observation tower or for other analogous purpose.

HORSE BOOT.—Thomas B. Mason, Trenton, N. J. This boot is preferably made of a divided soft rubber ring, to be fastened around the horse's leg with a hasp, the inner edge of the ring having flanges over which is stitched a padded cushion covered with enameled leather or analogous material, making a boot which will not absorb moisture, will retain its form, and may be readily put on and taken off.

DRESS STEEL.—Mary E. Whalen, New York City. This steel has a bow having metallic straps secured to it and forming a bow with double ends, that it may be maintained without strain on the dress, to give the desired set, without the front of the dress being drawn too tightly, while retaining the fullness of the skirt at the back without necessitating "shirring."

TRUSS.—James A. Tigner, Rome, Ga. This invention relates to trusses having a vertical spring carrying the abdominal and hernial pads, and a transverse spring to the ends of which the strap or band is secured, the invention covering a special construction of the truss.

GATE.—Harvey C. Riley, Perryville, Mo. This is a swinging gate with novel mechanism for operating it, so constructed and arranged that the gate may be readily opened by a person in a vehicle approaching the gate in either direction, and closed after the vehicle has passed through, without alighting from the vehicle.

SCIENTIFIC AMERICAN
BUILDING EDITION.

JANUARY NUMBER.—(No. 39.)

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Notes & Queries

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References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

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(242) F. V. H. asks: 1. I have a large picture frame to gild; what shade of gold leaf is used—light, medium, or deep? A. It is all a matter of taste. The deep color perhaps is most used. 2. How can I make a good sizing, so that the leaf will adhere to the frame evenly? A. Buy burnish-gold size ready mixed, and apply six or eight coats to the frame; polish the mat parts, before the size is quite dry, with a woolen cloth; give the parts to be polished another coat of size. The frame is moistened and the gold leaf is laid on. 3. I want to get a high polish on the smooth parts of the frame; how is it done? A. The bright parts are burnished when the frame is at a particular stage of dryness; flint or agate burnishers are employed, of different shapes. 4. I suppose it (the frame) will need varnishing after the gilding is done. What varnish is used? A. Use white hard spirit varnish, such as gum sandarac or yellow gold lacquer. The whole process of gilding a frame requires much skill, and we advise you to consult Spons' Workshop Receipts, first series, for an elaborate description of it. We can send the book free by mail for $2.00.

(243) J. C. W. asks: Does Germany own and control the railroad and telegraph systems within her domain? If so, how did she gain possession of them—by purchase? And how do the rates of transportation compare with the rates charged here in America, and is the revenue therefrom in excess of the expenditure? If Germany owns the railroad and telegraph, what influence, if any, does it make in politics, and are the masses of the people benefited, apparently, by government control, if such be the case, and how are they managed—by a government bureau? A. The railroads in Germany are comprised in three classes, viz., owned and controlled by the several state governments, 32,174 kilometers; private companies with roads under state control, 674 kilometers; private companies controlling their own roads, 4,286 kilometers. The state governments built some of the railroads, and purchased others from private companies. The revenue

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derived from the railroads is in excess of the expenditures, with the exception of a few secondary lines. The German telegraph lines are owned and controlled by the imperial government. Politics have no significance whatever in railroad or telegraph matters. The service is excellent, and the people are no doubt benefited by the unity of state management, the rates being less than in the United States. The management is under an imperial bureau located in Berlin.

(244) J. M. asks: 1. What kind of battery and how many cells would it take to light an ordinary house of six rooms? A. Use a secondary battery if you have any way of charging it. Thirty cells would suffice. 2. What power lamps would it take, and the probable cost per hour of this system of lighting? A. Twelve to twenty lamps would be required, and each lamp would cost about one-fifth cent per hour. 3. Would it be advisable to make the simple electric motor described in your issue of March last to drive the eight light dynamo? A. No. Drive the dynamo by power—by steam, water, or gas motor.

(245) C. T. I. asks: 1. Will inclosed wire answer for winding armature core (or ring) of electric motor, in March 17, 1888? Would it hurt to anneal it, as it is very stiff? A. Yes. Anneal it before making into ring. 2. Would wood soaked in hot paraffine do for disk in place of fiber? A. Yes. 3. Could I use five or six pieces of sheet zinc (riveted together) to produce the required thickness (¼ inch) of battery plates? A. You will have much difficulty in amalgamating the zincs without their breaking. We advise you to use solid plates. 4. Would four cells with 4 zincs and 4 carbons have the same power as eight cells of 2 zincs and 2 carbons? I want the battery as compact as possible, to be used on a tricycle. A. The larger number of cells give higher electromotive force, but also higher resistance. You can use either arrangement.

(246) J. M. R. asks how to clean zinc lining to refrigerators, stove zincs, etc., also how to clean silver, filigree jewelry, etc. A. Clean zinc with sapolio, or with ground pumice, soap and water. Clean silver filigree work by boiling in dilute sulphuric acid.

(247) R. A. B. asks how to make paint stick to bright metal tin roofs. A. Sandpaper the metal. It is better to put the paint directly on the new tin. Use metallic (iron oxide) paint with boiled oil.

(248) C. W. asks: Will you inform me how Pond's extract hammamelis is prepared? A. It is said to be made by distilling the bark with 6 per cent alcohol. Any certain knowledge of the virtues of witch hazel is disclaimed by the pharmacopœia.

(249) R. V. J. writes: 1. Please give the weight of water gas. A. Its specific gravity varies from 0·500 up to 0·650; 100 cubic inches will weigh from 15 to 20 grains. 2. Also the best and cheapest way to make hydrogen when but 6,000 to 8,000 cubic feet is required. Also how large a pipe will be required for 5,000 cubic feet of coal gas to pass through in one hour under ordinary pressure from our city works. A. Probably from iron scrap and sulphuric acid. You might do it more cheaply by passing steam over red hot iron borings, but it would hardly pay to set up the furnace, etc., for one operation. It depends on the length of pipe.

(250) H. D. L. writes: Is December 21 the shortest day in the year, or are there two or more days of the same length as the 21st? A. One day is always the shortest. Sometimes it is the 20th, sometimes the 21st, and sometimes the 22d.

(251) A. B. H. writes: What is cologne spirits? I want the information as a matter of information. It is used, I understand, principally in the adulteration of whiskies and brandies. I have looked in some of the encyclopedias, and cannot find it. I have taken your journal for a dozen years or more, and as a last resort concluded to trouble you. I would like the information in detail briefly put, so that in lectures on temperance I know what I am talking about. A. Appleton's Encyclopedia says (vol. vi., p. 144): "About three-fifths of the products of distillation in the United States are what are termed highwines or whisky, containing about 75 per cent of alcohol. This as it comes from the still contains a good deal of fusel oil. Some of it is made into cheap whisky, and the remainder is rectified and redistilled into French spirit. When the percentage of alcohol is high, it forms cologne spirit." Cologne spirit contains 93·075 to 94·075 per cent by volume of alcohol.

(252) H. P. asks: What sized dynamo (candle power or volt) is considered dangerous on coming in contact with the wires? A. This is a disputed point. An alternating current of 200-500 volts, with 300 alternations per second, is considered very dangerous. The best rule is to avoid touching electric wires.

(253) M. S. asks: 1. Some time ago we made an electrophorus by casting ordinary sealing wax in a metallic mould about an inch deep. As upper plate we used a circular disk of zinc attached to an insulating handle. On rubbing the sealing wax with a cat skin we failed to electrify it; none of the experiments given in connection with the instrument could be performed. Could you tell us our mistake? Is it perhaps the sealing wax? A. Your electrophorus may have had too smooth a surface. Try a cake of shellac instead of sealing wax. If your sealing wax refused absolutely to become electrified, it was of poor quality. Such material never gives satisfaction. 2. Could you recommend to us any reliable work on electroplating telling how to prepare the silver bath for electroplating? A. For full information on electroplating, baths, etc., we refer you to our SUPPLEMENT, Nos. 157, 158, 159. 3. How many Bunsen cells would be required to run a bath containing about 6 or 7 gallons of nickel-plating solution? A. Two one-quart cells in good order will suffice. 4. Is it necessary that the zincs and carbons of the bichromate battery be in separate cells? Could they not be put into one trough as well and produce the same current? If so, what would be the maximum number for a trough 2½ feet long, 1 foot high, 1 foot wide? A. Distinct effects are produced by separate couples in series or by one couple of large area of plates. The subject belongs to elementary electricity, and is treated in manuals of physics under Ohm's law. We recommend Niaudet's Electric Batteries, which we send you by mail for $2.50.

(254) W. R. K. asks: 1. Why a telephone will not operate long distances as well as the telegraph? A. The pulsations succeed each other with such rapidity that a long line becomes too sluggish in charging and discharging itself to act well. 2. Is there a fluid or solution that can be applied to paper to make it a good conductor of electricity? A. Solutions of chemical salts, such as sulphate of zinc, make paper conduct electricity, but not well. 3. Is there a first-class practical work on electricity brought down to the present time? Where can it be obtained, and the price? A. There are a large number of such works. Consult our book catalogue. We recommend Ayrton's "Practical Electricity," which we can send free by mail for $2.50, or Atkinson's "Electric Lighting," $1.50.

(255) S. O. N. writes: Could a man who is handy with hammer and saw and who has a little chemical knowledge and less money do some electrotyping? A. Electrotyping is done by electroplating processes described in our SUPPLEMENT No. 310 and others. The impression of the type is taken in wax, coated with plumbago, and copper is deposited on it. Afterward the thin sheet is "backed up" with type metal.

(256) J. M. C. asks the size in feet and inches of the Ark and Great Eastern. I see by a Western paper that the carrying capacity of the Ark was 500 times greater than the Great Eastern, and I want to know the reason why. A. Size of the Great Eastern, 692′×83′×60′ hold—18,914 tons. Ark, 450′×75′×45′ high. It may be estimated that the Ark had probably nearly one-half the tonnage of the Great Eastern.

(257) R. I. F. writes: I am oxidizing silver by the use of a hot solution of sulphuret of potash, but cannot get the color dark enough. A. Immerse the articles in a solution of mercurous nitrate and then treat with the sulphuret of potash.

(258) D. & A. write: We wish to know if riding in an electric street car will injure a watch. A. It is liable to do so.

(259) W. B. R. asks how coal tar and pitch, after having been melted by heat, can be prevented from hardening when cool. A. By mixing turpentine, naphtha, or some oil (linseed, fish oil, etc.) with the melted material.

(260) J. E. K. asks: What is meant by the ruling or reigning planet, as given in some of the almanacs? A. It is the brightest planet of the evening sky, and may refer to Venus, Mars, Jupiter, or Saturn, when we see them in their positions of greatest brilliancy.

(261) E. E. S. writes: 1. Will 35 feet or 80 ohms No. 36 copper wire (silk-covered) answer for one of the telephones described in SUPPLEMENT, No. 142? A. Yes. 2. How much wire will it require to wind magnets for first call bells (telephone) described in SUPPLEMENT, No. 162, and will No. 32 cotton-covered answer? The telephones are for less than a mile (Bell phones as No. 1). A. Wind the bobbins to the size shown with No. 32 cotton-covered wire. 3. What is meant by a single contact transmitter, and how are they constructed? A. One employing a single carbon electrode against a metallic point, or a pair of carbon electrodes against each other. See SUPPLEMENT, No. 250. 4. Should the spools on a pair of Bell telephones both be on the north or positive pole of the magnet, or one positive and one negative? A. It is immaterial.

(262) T. T. H. asks if there is any way in which the presence of coal gas can be detected in a house aside from the smell and taste. A. Chloride of palladium paper has been suggested. How to use it is described in SCIENTIFIC AMERICAN, June 11, 1887, page 376. 2. Whether furnaces are considered as healthful without water as with? A. Not generally; water is considered an improvement.

(263) C. R. H. writes: Will you give the formula for making mucilage, such as is sold in stationary stores at five cents per bottle?

A. Dextrine	2 parts.
Acetic acid	1 "
Water	5 "
Alcohol	1 "

(264) H. B. writes: I have a telegraph instrument, and the coils are wound for a much greater current than I am able to produce. Can I wind the coils for 15 or 20 ohms resistance? If so, what size wire and how many feet will it take? A. There is no particular art about winding your coils. If you use No. 30 wire, you can allow ten feet to the ohm and have a close approximation to the true resistance. One hundred and fifty to two hundred feet will give the desired resistance; 1,000 feet No. 30 pure copper wire at 75° Fah. have a resistance of 107·391 ohms.

(265) J. H. W. says: I have some 9×9 No. 20 sheet iron that I wish to thoroughly tin; will you please give me the best method through the SCIENTIFIC AMERICAN for cleaning and tinning the iron? A. Pickle the sheets in a bath of muriatic acid 1 part, water 4 parts, until the scale is removed, and dip in hot water. Then scour the sheets with a brush and sand, dry, and dip in a solution of muriate of zinc and ammonia, made by saturating muriatic acid with zinc and adding 10 per cent of sal-ammoniac. Dip only for a few moments, dry, and dip in the tin bath, holding the corner of the plate with a small tongs. The tin bath should have the surface kept clean by sprinkling with powdered sal-ammoniac and skimming the dross.

(266) B. J. K. writes: Can you give a way to make an electrical call bell? I would like to put it from one room to another, and desire to make it myself instead of buying it. A. For magneto call bell we refer you to our SUPPLEMENT, No. 162, which we can send you by mail for 10 cents; for general information, to Bell Hanger's Hand Book, which we can send you by mail for $1.

(267) A. E. M. asks for calculation for stay of boiler, and also for finding the horse power of engine. A. The United States boiler inspectors allow 6,000 pounds per square inch strain upon a stay. The total strain depends on its position, and must be calculated for each one. For non-expanding engine, multiply area of piston in square inches by steam pressure in pounds by length of stroke in feet and strokes per minute; divide result by 33,000; this gives indicated horse power. If engine has a cut-off, the average steam pressure must be used as a factor.

(268) E. E. V. writes: How may I construct several cells to produce power enough to run two 16 candle power incandescent lamps? How may I make them the simplest way possible, and how many cells will I have to use? A. Many batteries are described in our SUPPLEMENT, Nos. 157, 158, and 159, and in other numbers. A set of large two quart Bunsen cells is best, allowing three or four cells for each lamp.

(269) F. W. K. asks how to manufacture a bronze printing ink, an ink which shall retain its brilliancy, also how to dissolve bronze powder. A. Use bronze powder for printing; print with size and dust on the powder. No way of really dissolving it without destroying it is known.

(270) L. R. F. asks if there are any minerals or oxides that will change the color of Portland cement. We use oxide of iron for obtaining red color. Can we produce other colors? A. Ochers will give you other shades, and ultramarine will give blue. The mixture of colors will produce intermediate colors, subject, however, to a restriction in effect on account of the color of the cement itself. The ultramarine will not be very permanent; if not too expensive, some special make of blue smalt might be available. Oxide of manganese or graphite could be used for black.

(271) J. H. M. asks (1) what difference there is between bisulphite and crystal bisulphite of soda. A. Properly speaking there is no difference. 2. Would it do any harm to a gold solution to use a tank lined with common coal tar? A. No. 3. How to throw the gold down in a metallic state from an old plating solution and purify it without melting. A. Add ferrous sulphate (green vitriol).

(272) L. O. B. writes: I have read a great many pieces on the new phonograph, but there is one question I cannot find an answer to, and would like to have you tell me. Will the new phonograph chronicle anything said in a room, whether the person has mouth to mouthpiece or not? Could one be in a court room and chronicle all said by witnesses, or in a hall where a singer or speaker was and receive song or speech? A. The phonograph does not record sounds well, except such as are spoken into its mouthpiece.

(273) J. H. P.—For Paas or Easter egg dyes, use aniline colors. Do not eat the eggs if the shells crack.

(274) A. L. L. writes: 1. I wish to make an inexpensive solution, that shall be so clear as to resemble ordinary water, and upon dropping into it a small lump or crystal of some chemical, will (within the space of eight or ten seconds) change the solution to a jet black, one resembling ink. I wish it to work quickly and the substance dropped in to be small enough to be concealed between the fingers, as it is to be dropped in secretly. About a quart of the solution to be used at a time. A. Use aniline black in water. Your trouble will be in the slow mixing of the fluid; you should be able to stir it. It will also tend to blacken your hand. 2. I wish to insert into the top of a table, and flush with the surface, a metal plate about five inches square. The top of the table, including the plate, is then to be covered with cloth glued or cemented on, same as a desk top. I am advised to use a zinc plate, but wish to use a brass one. Will the cloth adhere to a brass plate as well as to zinc? What is the best glue or cement to use for the purpose? A. Brass will answer perfectly. Use a solution of gum tragacanth. For marbles apply to toy stores.

(275) W. F. G. says: 1. I wish to make some small iron castings, but have no cupola. Can you tell me how to melt the iron? A. You can readily melt 4 to 6 lb. of cast iron in a black lead crucible in a forge fire. Put some bricks around to deepen the fire. 2. Can you give me a receipt for a cement that will fasten hard rubber to iron? A. Dissolve pulverized shellac in ten times its weight of strong ammonia, in a closed bottle; let it stand two or three weeks, when it becomes a jelly. Smear the parts and press together. 3. What is a good japan for the iron? A. You can purchase air-drying or baking japans through the varnish trade. Also see SCIENTIFIC AMERICAN SUPPLEMENT, No. 316, Japans and Japanning.

(276) G. S. B. asks the kind of a reflector he would require for a four inch double condenser. State how far I must place it from the condenser, how large it must be, and how much it must concave. A. A silvered copper reflector, 4 in. diameter. Radius of the concave surface to be the same as the distance of the light from the first condensing lens, and placed back from the light a distance equal to its radius.

(277) J. E. W. asks how to make glue water proof? A. Dissolve of gum sandarac and mastic each 5⅓ drachms in one-half pint alcohol, and add 5⅓ drachms turpentine. Place the solution in a glue boiler over the fire and gradually stir into it an equal quantity of a strong hot solution of glue and isinglass; strain, while hot, through a cloth. Or to plain glue solution add bichromate of potash; on exposure to light it becomes waterproof.

(278) A. J. B. asks: 1. How to obtain a black cold dye for goatskins with the hair on? A. Rub into the hair, with a brush, a solution of ½ oz. nitrate of silver in 1 pint soft water, and hang in sun to dry. Afterward apply, in same way, a solution of 1 oz. sulphate of potash in 1 pint of water. Dry in sun; afterward rub off and dry in shade; work occasionally while drying. To intensify, apply a solution of pyrogallic acid before rinsing. 2. Also how to make sensitized paper for photographs, brown or black preferred, which can be fixed by immersing in cold water? A. No such process is known.

(279) I. G. asks: What cheap substance will prevent from freezing a cologne made with oil of verbena without destroying the odor and color? Rock salt and alcohol do not answer the purpose? A. Glycerine: a sufficient quantity, however, may impair the cologne, as it will prevent it from drying; alcohol is the proper substance.

(280) L. B. asks: With six or seven volts E. M. F., how many amperes of current will be required from a battery in order to run a two candle power incandescent lamp? A. 4½ to 5⅓ volts with 1·20 amperes will light a 2 C. P. lamp. 7 volts with 1·50 amperes will light a 3 C. P. lamp.

(281) R. M., Jr., says: I read with interest your article in a late issue about a railroad being built across the Rocky Mountains in the State of Colorado. I am a young man 21 years of age. What I would like to know is this: Is there any chance for me to get outdoor work in the region where this road is being built? I have no trade; worked two years as brakeman on elevated railroad, resigned on account of throat trouble; five years' experience in retail grocery business in New York City. A. Colorado is a new and flourishing State. Its interior position makes the climate dry and healthy. Your chances in finding employment to suit your taste are problematical.

(282) G. K. writes: Can you inform me how to clean the stencil paper (after printing) of the cyclostyle patent? I wish to remove the surplus ink from the letters; have used blotters; they do not seem to answer fully the purpose of removal; cannot get a clear copy after being laid aside for some days. A. Try sponging off with benzine or kerosene oil.

(283) W. H. T. asks how brass wire spiral springs are so made that the spirals close together when the tension is removed? And how brass is tempered? A. Flat or volute springs are wound in a narrow groove or between two plates made to separate, to allow the spring to be taken out. Helical springs are wound on a mandrel, and at the moment of winding drawn hard against the last turn, so that when finished all the coils touch. Brass cannot be tempered; sheet and wire spring brass is a special composition, which is rolled or drawn very hard, and is then called spring brass in the hardware trade.

(284) E. D. S. asks: 1. For the composition used for cleaning carpets on the floor; it looks a good deal like soft soap. A. Use 1 pint oxgall to a pailful of water; after washing apply cold water to rinse out the oxgall, and finally sponge as dry as possible. 2. Composition for cleaning wall paper on the wall. This composition is used in bread crumbs. A. For wall paper use plain bread crumbs.

(285) W. F. asks: 1. Please tell me, through your paper, if there is a way of blue printing so that we may have a white ground and blue lines, instead of the opposite? A. Yes; See SCIENTIFIC AMERICAN SUPPLEMENT, 584, p. 9320, for description of Pellet's process. 2. If a current of electricity is passing over a naked copper wire, is there a way known to propel a trolly along wire, without a motor being attached to trolly to drag or propel same? A. Consult our SUPPLEMENT, Nos. 417 and 420, for description of telpherage, a system of electrical cable transportation that includes a self-propelled trolly.

(286) E. H. asks: Does drawing steel wire crystallize it? A. No. It laminates and strengthens steel wire to draw it to smaller sizes. When properly done, the tests show increased tensile strength and elasticity.

(287) —— writes: What will it cost, and what size of an electrical machine will it take, to turn a wheel 9 in. in diameter, having paddles 3 in. wide and 4 in. high, when partly submerged in water? A. Use simple electric motor described in SUPPLEMENT, No. 641. You should sign your letters.

(288) Subscriber writes: Will you please give me the formula for making blue black ink, that is, ink that writes blue and turns black? A. For inks, consult our SUPPLEMENT, No. 157, also Techno-chemical Hand Book. We can send the latter free by mail for $2.

(289) W. R. asks: Which would you recommend for an electric light, say to be worked five hours every day—a secondary battery of 20 small couples or 30 Grove batteries, platina, 3 in. by 1 in.? A. The secondary battery. The Grove battery will be very expensive and troublesome.

(290) N. B. C.—The samples sent are talcose clay.

(291) A. L. C. asks: 1. For the correct pronunciation of the word ampere? A. Pronounce it with stress on the second syllable, thus: "ampeer." 2. The meaning of ampere hours? A. See answer to query 236. 3. In the 8 light dynamo, I have broken off one of the armature wires; is there any way of remedying this except by rewinding? A. Wrap a thin piece of brass or copper foil around the ends, flow with solder, and wrap with shellacked tape. 4. How much will it cost to build the simple electric motor? A. From $3 to $25. The first figure covers materials only. The other covers time and material.

(292) J. D. E. asks: How much harm, if any, is done to the springs of drays by letting their customary loads remain on them overnight, or for 48 hours? It doesn't seem to me that more harm will arise than comes to them from jolting over the rough pavements. A. All springs weaken and finally give out from use. Anything that lessens their use or strain adds to their life. A load left on a wagon overnight occasionally would not be perceptible in its wear.

(293) W. H. H. asks: How to make phosphor bronze? A. The phosphor bronzes vary somewhat, for various purposes, from two to three ounces of tin to a pound of copper; to which is added a small portion of phosphide of copper or phosphide of tin as a flux—the exact proportions for special alloys being held as trade secrets by parties manufacturing these alloys.

(294) H. H. H. says: I wish to heat a store with steam, room 22 × 115 × 14 ft. 2 in. By running pipes in cellar to and from radiators, it takes considerable pipe, that will condense a quantity of steam. If I carry the steam directly from the boiler to a coil of pipes (bronzed) suspended from the ceiling directly over the counters, of sufficient height so they can be used for the display of goods, can I get heat on the floors? It has been suggested to me that the lower part

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of the room will not be heated unless I have the coils or radiators on the floor. How many feet of inch pipe will be required to heat the room? A. The overhead system of heating by steam is largely used in factories, and occasionally in closed rooms. In factories where the belting produces circulation, it is very desirable. We do not advise the use of this system for heating a store, where the constant opening of doors will precipitate cold air upon the floor. Coils in stacks or along vacant spaces or counter fronts, or radiators, are more suitable for stores. It will require 900 feet of 1 in. pipe or its equivalent in radiator surface to heat your store.

(295) C. J. H. writes: I saw a receipt in the SCIENTIFIC AMERICAN about a year ago for making a substitute for ivory out of potatoes. Can you give me the reference? A. See SCIENTIFIC AMERICAN, June 18, 1887, p. 392. The potatoes are washed in dilute sulphuric acid, then boiled in same until solid and dense. They are then washed free from acid and dried.

(296) R. J. L. asks: 1. Will carbons used in lighting street lamps answer instead of carbon plates in plunging battery, SCIENTIFIC AMERICAN SUPPLEMENT, No. 157? A. Yes. See SCIENTIFIC AMERICAN, October 27, 1888, p. 264. 2. How can I attach wires, handles, etc., to a galvanic battery? A. Use binding screws or wires cast in metal tops.

(297) O. S. asks how to make a good violin bow resin? A. A leading authority gives the following: "Put a quantity of Venice turpentine in a pipkin, add a little water to it, and boil for two or three hours over a slow fire. As it rises pour in small quantities of cold water to keep it from overflowing, and allow a drop now and again to cool on a plate; when it rubs clear between the fingers without sticking, it is sufficiently boiled; when thus boiled, pour it into cold water; work it well with the hands to press out the water, and break it into pieces when cold; expose to the sun and air until all the moisture is evaporated and the resin is quite transparent. Many violinists adopt a method of purifying and rendering the resin more transparent by boiling it in vinegar, and while it is warm pouring it into paper moulds, after which it is exposed some time to the sun and air."

(298) P. N. asks: 1. Is there anything a person can rub on the hands, to keep cement from burning, and making them sore, without the use of gloves? A. Use oil or tallow. 2. The best remedy to use when they get that way? A. Use oil as a remedy. 3. Is not cement supposed to set in water? A. Hydraulic cement sets in water. 4. What is the time to allow cement to get properly set? A. From a few hours to several days. 5. Is there anything that can be mixed with oil to take the stickiness from it and make it thinner, such as castor or olive oil? A. Turpentine or benzine; for castor oil, you may use alcohol. 6. What is the reason that they always put the small wheels of a wagon or carriage in front? Is it for handiness in getting around, or does it run easier? A. To facilitate turning the wagon.

(299) H. B. asks: Please tell me how to make a Bunsen battery, and how long the acid can be used before changing? A. See our SUPPLEMENT, Nos. 157, 158, and 159, for descriptions, with illustrations, of all leading forms of batteries. A solution in a Bunsen battery will last from four hours to several days, according to the demand made upon it.

(300) F. W. writes: I desire to get some information on the manufacture of wood alcohol. Will you please advise me where I can get it? A. Spons' Encyclopedia of Industrial Arts, Part I., treats of wood alcohol. We can supply it for 75 cents.

(301) J. O. B. asks: 1. What is the greatest power yet obtained in experimentation with a dry electric battery? A. Results comparable with those from good gravity batteries have been obtained with dry batteries. 2. What are the electric generating substances employed? A. Sulphuric acid or caustic soda may be used as exciting agents, with zinc as the positive plate. 3. What is the commercial value of aluminum steel, containing 1·75 per cent of aluminum? A. No particular value could be assigned it. 4. As a general rule, is blue clay rich in aluminum? A. Blue clay may or may not contain a large proportion of aluminum. There is no general rule.

(302) H. N. B. asks: 1. What are the formulæ for commercial cream tartar? A. Hydro-potassium tartrate, $KH.C_4H_4O_6$. 2. Salt of tartar. A. Purified pearlash or potassium carbonate, $(K_2Co_3)_2$ $3\ H_2O$.

(303) A. L. asks: Can paraffin be made transparent without making it liquid? A. No.

(304) For waterproofing processes we refer M. to our SUPPLEMENT, Nos. 577, 137, 373, and 410.

(305) R. M. asks: What proportions of bromide of ammonium and cadmium are employed in formula for collodio-bromide emulsion in query 22, November 24, 1888, issue of the SCIENTIFIC AMERICAN. A. The double salts spoken of are not commonly found in this country. Use instead bromide of cadmium 44 grains, bromide of ammonium 12 grains. After drying and washing the emulsion, it is redissolved in equal parts of alcohol and ether, in the proportion of 24 grains to the ounce of these mixed solvents. See SUPPLEMENT No. 572 for full particulars on collodion emulsions for window transparencies. No preservative is required for washed emulsions. Camphor is used as a preservative for starch pastes. For enameling add 4 parts castor oil to 100 parts plain collodion. To recover gold from toning baths add to each gallon of toning solution a solution containing thirty grains of protosulphate of iron. Put the gold solution into a barrel or, better still, a special shaped vessel having the bottom pointed like a wedge, with a faucet a third of the distance up from the bottom. Let the solution stand for twelve hours. The gold will settle to the bottom, then decant off by a siphon the supernatant liquor, leaving the residue of metallic gold, together with waste liquor in the bottom, at a depth of three or four inches. This latter material is then removed and thrown on a filter of bibulous paper, washed by pouring hot water over it, and, when dry, the gold is converted into chloride of gold. The hot water should constantly be poured on it until the wash water no longer produces a precipitate with a solution of barium chloride, proving that the gold is free from the excess of sulphate of iron. The washed precipitate of gold is now dissolved in aqua regia, and the solution evaporated nearly to dryness, the latter operation being carried on slowly on a water bath, to prevent spurting. The yellow chloride of gold thus prepared should be preserved in a well stoppered bottle or in a sealed tube, as the salt is very deliquescent.

(306) W. B. asks for the composition of the small pellets used in the toy called Pharoah's serpents. A. Sulphocyanide of mercury is the basis of the ordinary preparation. We refer you to our SUPPLEMENT, No. 259, for description and illustration. As the vapors from the burning sulphocyanide of mercury are injurious, the following is recommended as a substitute:

Bichromate of potash	2 parts.
Nitrate of potash	1 "
White sugar	2 "

Pulverize each ingredient separately and mix intimately, and slightly moisten. Press into small paper cones and when perfectly dry they will be ready for use. This preparation is poisonous, but emits no injurious vapors.

(307) E. M. C. writes: 1. I have a short telegraph line which works by a battery of four Daniell cells. It has worked very well for two weeks, but lately, when I close the circuit, the current seems to grow weaker and weaker, till it stops entirely and the armature flies up. I will be very much obliged if you will tell me what is the matter? A. Your battery has run down. It probably needs more blue vitriol, possibly some of the solution should be removed and replaced by water. The zincs also may need scraping. 2. What is the most simple storage battery to make and how many does it take to run an Edison eight candle power miniature incandescent lamp? A. 17 or 18 cells. You will find many forms described in our SUPPLEMENTS. None are easy to make. It is probably better policy to buy them.

(308) S. C. T. asks (1) how to melt or dissolve rubber to use similar to varnish or paint, or process of using it preparatory to making balls of the clear article. Foot balls or syringe bulbs. A. India rubber cannot be practically treated as you describe. We refer you to our SUPPLEMENT, Nos. 249, 251, and 252, for description of the treatment and manufacture of this product. 2. Can old rubber be worked over? A. Old rubber can be mixed with new and thus made over, but the result is always inferior.

(309) J. F. D. says: I am at work on a grape basket. My difficulty lies in the breaking of the veneer. Can you give me a receipt for the bending of the veneer, by using chemicals or soaking otherwise than by steaming, as it takes them so long to dry after being formed into the basket. I mean something to make the veneer flexible, so it can be bent up in any shape without breaking. A. There is nothing but steaming that is practicable for bending basket veneers. They should be bent hot, when they will be dry enough to finish in a very short time. A warm room will finish the drying in a reasonable time. Steam or boiling water only is used by basket makers, when necessary, otherwise cold water.

(310) C. McE. asks: Can an oil stove be so constructed so that the smoke, odor, etc., can be drawn up through the chimney of a house like any other stove? A. Yes; there is no reason for mingling the gases of combustion with the air we breathe, when there is a chimney opening convenient.

(311) Milwaukee asks if anything will prevent the constant cracking and breaking of the shades and globes around gas jets. No matter how carefully shielded from draughts, they still continue to crack and break. A. The opening at the top of the shade is too small or the gas jet is too large. There is no trouble where they are properly proportioned.

(312) W. S. asks: 1. What horse power can I get from 150 inches of water, velocity 257 feet per minute, on 15 feet overshot wheel? A. The whole value of your water-flow and fall is 7½ horse power, of which you may realize, with a good overshot wheel, 5 horse power. 2. Is the pressure on inclined water pipe computed by its perpendicular only? A. The value of the pressure is due to the vertical height.

(313) J. L. C. asks for a receipt for making shampoo for cleaning the scalp, also from dandruff, not to in any way damage the hair or scalp? A. Rum 1,000 parts, alcohol 120, tincture of cantharides 5, carbonate of ammonium 5, salt of tartar 10; after shampooing wash with cold water.

(314) E. R. asks for a receipt for a good stencil ink for marking boxes, barrels, etc., through a stencil. Also a paint for marking with brush, not using stencil. A. For a fine preparation use shellac 2 ounces, borax 2 ounces, water 25 ounces, gum arabic 2 ounces. Color with fine lampblack, to desired consistency. You may use turpentine and lampblack with a little linseed oil, or even glue and water with lampblack. Thin for use as a paint; use somewhat thicker for stencil.

(315) B. O. H.—The removal of superfluous hair by electrolysis is treated of in our SUPPLEMENT, Nos. 176 and 353, which we can send you by mail for ten cents. A really simple way of removing hair is not known.

(316) G. R. writes: I would like to know how to construct a plunging bichromate battery, and what size required to run a one man power motor, also a field magnet. A. For directions relative to construction we refer you to the SCIENTIFIC AMERICAN, August 20, 1887. From 100 to 150 such cells will represent one horse power, for one man power use 10 to 20. The larger number is to be preferred. For field magnet construction see our SUPPLEMENT, Nos. 160, 600, and 641, which we can send you for 10 cents each.

(317) O. F. S. writes: 1. Will you inform me how long an ordinary incandescent lamp carbon will burn in air? A. It will instantly be destroyed by access of air. 2. And if there is any liquid that will be attracted by a permanent magnet? A. No.

Enquiries to be Answered.

The following enquiries have been sent in by some of our subscribers, and doubtless others of our readers will take pleasure in answering them. The *number* of the enquiry should head the reply.

(318) E. E. P. asks how a preparation called plastic is made. It is used in decorative and fresco painting. It is applied with a brush by one man, who goes ahead and is followed by another, who stipples it with something like a broom scrub brush. And this preparation pulls out and becomes rough like a scratch coat of plaster. Designs are then scratched on this to suit tastes.

(319) W. E. asks: When will occur the next total eclipse of the sun visible in the vicinity of New York?

(320) S. L. F. asks: Will you kindly give me a rule for working out the following problem. What is the areal strain on ⅞ inch staybolts placed 6 inches apart, with one hundred pounds pressure of steam?

(321) S. H. P. says: I should like to ascertain, if possible, the diameter, area, and number of blades of a propeller, and power required, to drive a vessel having a resistance of 3,000 pounds through the water at the rate of 7 knots per hour.

Replies to Enquiries.

The following replies relate to enquiries recently published in SCIENTIFIC AMERICAN, and to the numbers therein given:

(72) K. C.—Petrifying Springs.—There are such reported springs in the Yellowstone Park, and other parts of the United States. They are not petrifying waters, but rather incrustating waters. An object placed in the water will soon be covered with a coating of carbonate of lime. This is an entirely different operation from petrifaction, which is a chemical interchange of elements, by which the wood becomes silicified entirely, though retaining its wood identity. We do not know that there is such petrifaction now taking place. It is now only known as the fossil remains of a previous geological age.

(76) F. R.—The relief valve is known, and can be obtained through the pipe trade, as a back pressure valve. 2. In piping drying kilns, the coils should be so arranged as to allow more than the full area of the exhaust pipe throughout the system to avoid back pressure. 3. Bridge wall should be from 7 to 10 inches from the boiler and may be straight or curved. Both forms have their advocates among mechanical engineers.

(79) K. & W.—Running Engine.—You fail to state the number of revolutions required, or the condition of the cut-off: 50 to 55 pounds boiler pressure should enable you to give the piston a mean pressure of 40 pounds per square inch, which, with a speed of 75 revolutions per minute, will make 30 horse power. The pipe should be placed in a box at least 10 inches square inside, and filed with sawdust if better material is not at hand. Pulverized charcoal, mineral wool, or asbestos is preferable.

(80) G. A. S.—Smoke Stack Protection.—Your smoke stack will be safe from lightning if you make a good iron or copper connection from the base to the water way in the ground. This may be done by driving an iron rod to the water level, or sinking a drive well pipe where you can be sure that you have a water connection. If you have a well, it will answer the purpose to connect with the water in it.

(85) A. J. C.—Damp Walls.—Paint the outside of your rough-cast walls with raw linseed oil. When this has become set or dry, paint again with any desirable color, mixed with boiled linseed oil. The dampness inside may also arise from the faulty method of plastering upon the wall, instead of furring and lathing. If the dampness is at the bottom or next to the base board, it may be derived from the ground by absorption through the brickwork. In such cases, clearing away the soil to two feet below the floor beams and plastering with asphalt, or painting the wall with two coats coal tar, will remedy the dampness.

(126) B. L. A.—Heating Room. — You are right. Fresh air must enter to take the place of air ejected by ventilation. If cold, it will fall to the floor unless arrangement is made for its contact with heating pipes in room. 2. It can if air is provided by special inlet to supply combustion within the stove. 3. Yes; Heat is transmitted by radiation, and also imparted by convection or contact with a conveying medium, as air or other gases and fluids.

(128) O. S.—Violin Bow Resin.—Select the best clear brown resin, melt it in a clean basin, to nearly a boil, which will clear it of turpentine or other volatile oils. Pour in paper moulds.

(130) P. C. W.—Old Gold Braid.—The old and soiled gold braid cannot be restored. Replace it with new.

(131) S. B.—Work of Pulleys.—The set screw power, as you call it, or resistance, depends upon the product of the leverage or semi-diameter of the pulley multiplied by the tension of the belt in each case; the difference in the diameter of the respective shafts being also a factor.

(132) W. H. M.—Razors.—Razors are hardened and tempered in the rough with the cutting edge thick, to avoid cracking, and then ground thin. You cannot harden your razor. Try a new one.

(134) C.—Engine and Boiler.—For your 20 H. P. engine, a 30 H. P. boiler is the cheapest in the fuel account.

(135) A. A.—Electro-Plating.—You will find the subject fully treated in a work on "Electro-Deposition," by Watt, $3.50, which we can mail.

(136) C. B. S.—Thrashing Machine and Engineering.—If the tumbling rod connection is properly made and free running, you should lose less than 10 per cent of the power. 2. Study electrical works in the special line that you wish to pursue. (See our catalogue for valuable works which we can furnish.) 3. As a profession, electrical engineering is progressive, and compares very favorably with civil and other branches of engineering.

(139) A. G. D.—Cold Box in Ice House.—You must have ice packed around and above the cold box. The tendency of cold air from the ice is always downward.

(140) F. W. E.—Poisonous Cookery.—There is nothing made better than the porcelain lined kettles for cooking fruit. We fear that you will find the trouble somewhere else. Systematic search may reward you with the information requested.

(141) H. B.—High Explosives.—A work on "Modern High Explosives," by Eissler, treats of the chemistry, manufacture, and use of the best high explosives used in the United States. The names that you mention are mostly foreign explosives that have been experimented with by U. S. naval officers. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 674, for an account of them.

☞ Books or other publications referred to above can, in most cases, be promptly obtained through the SCIENTIFIC AMERICAN office, Munn & Co., 361 Broadway, New York.

NEW BOOKS AND PUBLICATIONS.

TOWN AND COUNTRY SCHOOL BUILDINGS. A collection of designs for schools of various sizes, graded and ungraded, with descriptions of construction of sanitary arrangements, light, heat, and ventilation. By E. C. Gardner. E. L. Kellogg & Co., New York and Chicago. 1888. Price $2.50.

In this work the whole operation of building country schools, from the preparation of the ground to the development of the best sanitary appliances, is treated. The book begins with a description of a log building of one room for pioneers. It then gradually develops the subject until the large brick building for graded work is reached. Alterations, ventilation, out of door surroundings, and detached suggestions are also treated of. The designs for buildings, accompanied by their plans, are numerous and tasteful, the author departing radically from the idea that the school house must be plain and ugly. The cuts number 124.

GORED MAPS OF THE NORTHERN AND SOUTHERN HEMISPHERES. Chicago: E. Hollenshade.

These gored maps are printed on two sides of a sheet 28×30 inches in size, one side representing the southern and the other the northern hemisphere, with their respective poles in the center. They are each designed to represent the true surface of a hemisphere, so that if folded over a spherical mould, the gores, or unprinted portions, would be found to be surplus, and the printed or pictorial portions of the surface present the precise relations that different and widely separated divisions of the earth bear to each other latitudinally and longitudinally.

Messrs. Styles & Cash, the well known New York printers and stationers, get out an unusually large and handsome calendar this year, and, in addition to the dial for marking the days as on the face of a clock, there are fine surrounding views of the homes and haunts of Washington, especially appropriate for this centennial year of Washington's inauguration.

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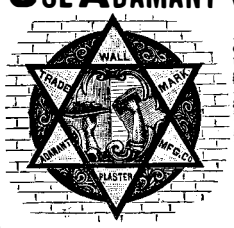

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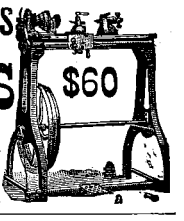

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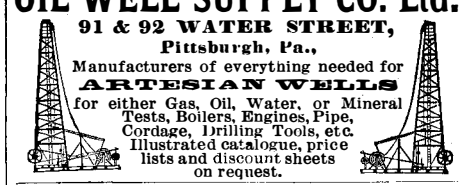

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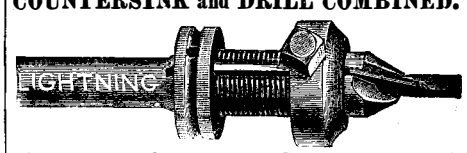

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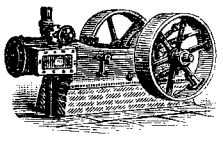

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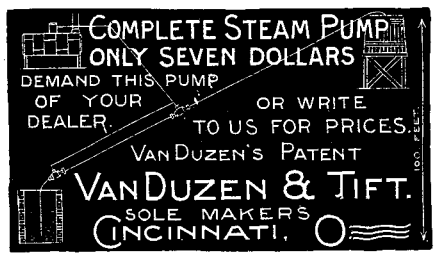

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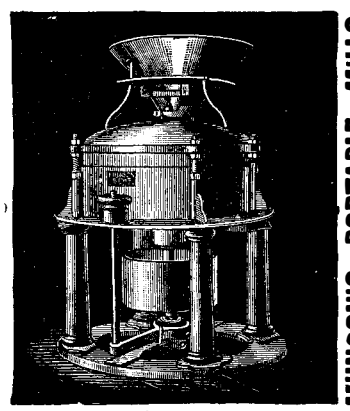

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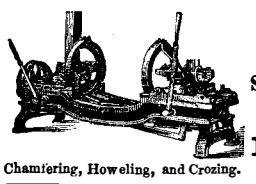

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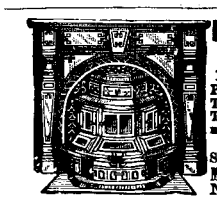

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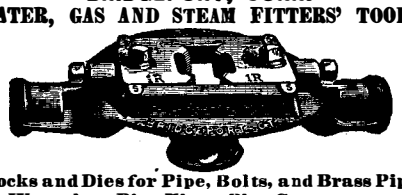

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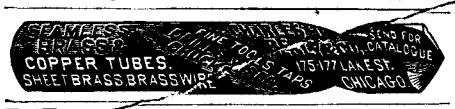

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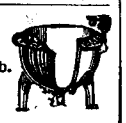

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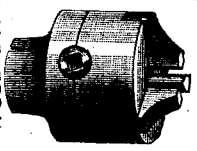

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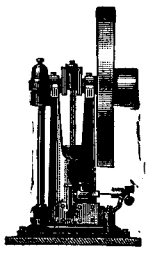

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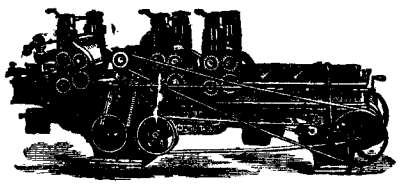

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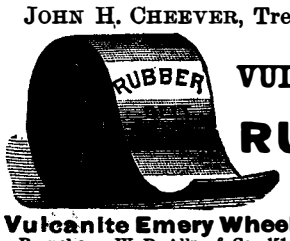

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